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ORIGINAL ARTICLES.

SYMPHYSIOTOMY, WITH A SUCCESSFUL CASE.[1]

BY W. WINTERBERG, M.D.,
OF SAN FRANCISCO, CALIFORNIA.

THE operation of symphysiotomy was first suggested by Pineau in his work on *Surgery* in 1598. La Courvée first performed it on the dead body in order to save the child in the year 1655, and Plenk did it for the same purpose in 1766. In 1777 Sigault first proposed the operation to be done on the living, and Ferrara was the one to carry out practically the proposition; still Sigault is generally considered to be the first symphysiotomist. In the eighty-five operations performed from that time to 1858 there was recorded a mortality of thirty-three per cent., a result which was not very favorable for the dissemination of the operation. It is, therefore, not very surprising to find that with the year 1858 it had practically died out.

It was revived in Italy in 1866, and performed in seventy cases within the following twenty years, with a mortality of twenty-four per cent.

Pinard was the first to follow the example set by the Italians, and in 1892 he performed symphysiotomy for the first time in Paris since its abandonment in 1858, and soon the other European countries followed his example.

In this country, Dr. Coggin, of Freedman, Alabama, now of Athens, Georgia, operated successfully for mother and child only seven weeks later than Pinard. Dr. Barton Cooke Hirst, Dr. Jewett, and Dr. Garrigues were the first operators in Philadelphia, Brooklyn, and New York, respectively. On the Pacific coast the first symphysiotomy was done by Dr. Holmes, of Portland, Oregon; and in California my own case has been the first, so far as I have been able to ascertain.

The purpose for which this operation was originally devised is to deliver a living child *per vias naturales* in certain forms of contracted pelvis in which formerly Cesarean section was imperative to accomplish this end. The question, therefore, obtrudes itself: What are the advantages and disadvantages of this operation as compared with conservative Cesarean section?

In studying the latest statistics of the results of the two operations we find that the danger to the mother is far greater in the last-mentioned than in the first. In Europe, in the hands of the best operators, the maternal mortality has been about ten per cent. in ninety-nine cases of Cesarean section, and in Leipzig there have lately been recorded fifty-four cases with but three deaths—less than six per cent.; but in this country the results have not been so favorable. A table compiled by Dr. Harris, of Philadelphia, shows the following results, beginning only with the year 1887, and omitting the period from 1882 to 1886:

Operations of	No.	Women recovered.	Children saved.
1887	8	5	8
1888	13	5	13
1889	9	6	8
1890	17	13	16
1891	10	7	6
1892	12	9	12
1893	10	6	6
	79	51	69

In a total of 79 operations performed there are 28 maternal deaths, or a mortality of 35.5 per cent. Taking the year 1893 alone, we find four deaths out of ten—a mortality of 40 per cent. This is certainly a frightful mortality, and so much the more discouraging, as there does not seem to be any improvement at all that might have been reasonably expected from an improved technique and a rapid advance in aseptic surgery. As to the infantile deaths, we see by the same table a mortality of about 12.5 per cent.

The earlier statistics of symphysiotomy show a much greater mortality than would have first been anticipated. Thus, Dr. Barton Cooke Hirst, in an address delivered before the Washington Obstetrical and Gynecological Society, November 17, 1893, states that in 212 operations since 1887 there have been 27 maternal deaths, a mortality of 12.73 per cent., while the deaths of the infants raise up their mortality to a little over 28 per cent.

Varnier (*Annales de Gynécologie et d' Obstetrique*, 1893, p. 241) tabulates 124 cases, as follows: Maternal deaths, 12; infantile deaths, 32. Of the 12 mothers lost, 8 died from causes entirely disconnected from the operation; of the remaining 4, one died of septicemia, one of sphacelus of the vulva and vagina, one of cellulitis and peritonitis due to the use of the saw and to forcible introduction of hand and arm in order to effect version; one of

[1] Read before the American Medical Association, at San Francisco, June, 1894.

hemorrhage, shock of operation, and of lacerations of perineum, vulva, and bladder. Of the infantile deaths, five cases should be eliminated in which the operation had been done in place of embryotomy. Of the remaining 27 deaths, 7 were due to causes not related to the operation, 11 to mishaps with forceps or in version, 7 in succession to incomplete section, 1 to prolonged extraction due to distortion of the right arm, 1 to a cerebral lesion owing to prolonged pressure on the head. The later statistics of Morisani give, in 55 cases, 2 maternal and 2 infantile deaths; and Zweifel (*Centralblatt für Gynäkologie*, 1883, No. 22) reports 14 cases from the Leipzig clinic with favorable results to mothers in all. One child died from asphyxia, and one from pneumonia two days after birth.

Puech reports 73 cases, with a maternal death-rate of 4.1 per cent., and 24.6 per cent. of infantile deaths; and Pinard operated in 19 cases, with no maternal deaths; 3 children died, but not directly from the operation. Owing to the rapid spreading of the operation all over the world within the last year it is impossible to compile an accurate statistical table; but the last figures seem to justify the conclusion that the results both to mother and child are rapidly improving, and that as compared with Cesarean section the balance of safety is decidedly in favor of symphysiotomy. Leopold himself, who certainly cannot be said to be prejudiced against Cesarean section, holds that the mortality in this operation is, and always must be of necessity, greater than in symphysiotomy, and the latter operation ought to take the place of the former in all those cases in which it is practicable.

Apart from the greater safety which it gives to the mother, symphysiotomy certainly has the advantage of greater simplicity and easier execution, and it is unintelligible to me how Dr. Barton Cooke Hirst can claim that the lower maternal death-rate is the *only* reason which should make it the operation of election in practicable cases. The much more complicated apparatus necessary for the performance of Cesarean section certainly is an objection to it, as compared with the simple outfit required for symphysiotomy.

It is true that successful Cesarean sections have been performed in former ages with the most primitive instruments, and without any of the paraphernalia that we now think indispensable for the performance of a capital operation, not to speak of trained assistants, or our whole antiseptic apparatus. But, let me ask, is there any one who would feel safe if he had to do a Cesarean section with no more instruments, no more antiseptic apparatus, no more skilled assistants, than are actually necessary in order to perform symphysiotomy?. I believe not. If we could treat all our patients in well-managed hospitals, where everything needed for a capital operation is always in readiness, I might concede that the respective outfit necessary to perform either operation did not deserve much consideration; but as long as we sometimes have to operate in out-of-the-way places, with the most unfavorable surroundings, I think it a great help to simplify matters as much as possible; and I think, likewise, that symphysiotomy is the operation that can safely be done with the simplest means. As to the operation as such, it is certainly easier for the operator, and the directly opposite view of some well-known operators to the contrary notwithstanding, I maintain that it requires much more practical experience and surgical skill to perform Cesarean section than symphysiotomy. As a matter of course, every medical man cannot possibly have an opportunity to study the technique of Cesarean section, and it is, therefore, of great value to be in possession of a simple method that will enable us to dispense with the more dangerous, the more difficult, and the more complicated operation in certain well-defined cases of labor, and we all must be prepared to face such cases sooner or later.

Simple, easy, and safe as the operation of symphysiotomy is in itself, it cannot claim these advantages when the question as to the after-treatment arises. This is undoubtedly one of the weakest points of the operation, and it is very likely due to this weakness that Schauta would prefer Cesarean section to symphysiotomy in *private* practice. The management of the case after delivery requires close attention and good nursing, such as are not always to be had outside of hospitals; and I perfectly agree that the after-treatment of a case of Cesarean section is much simpler and easier.

Of some other considerations against symphysiotomy ought to be mentioned the likelihood of serious tears in the anterior vaginal wall, the urethra and bladder, which, of course, are very serious accidents, and should they occur much oftener than they actually do would soon make the operation decidedly undesirable. But I think that with an improved technique we shall soon learn how to avoid these accidents.

The objection that has been raised against symphysiotomy on the ground that the forceps or version may still be required to effect delivery after the operation has been done is hardly serious enough to deserve notice. One might just as well object to Cesarean section on the ground that after opening the abdominal wall there was still another operation left to be done, namely, that of opening the uterus and removing the fetus.

Dr. Barton Cooke Hirst, in the same address referred to before, mentions as considerations against symphysiotomy: the need of good assistants; the absolute necessity of as thorough asepsis as is de-

manded in abdominal surgery. As to the first of these two points, good assistants are always desirable in every surgical operation; but in my opinion, and to judge from the experience that I have had so far, there are few other operations that could be satisfactorily accomplished with so little assistance as this one. In the case in which I operated myself I was assisted only by my son, a medical student in his second year, Dr. Dodel administering the anesthetic, and still there was no serious difficulty encountered, with the exception that the bed upon which the patient rested broke down toward the latter part of the operation, and I had to finish with the mattress resting on the floor. I do not think that a staff of trained assistants would have prevented this accident. As to the thorough asepsis demanded, I do not think that that should be called an objection, unless we apply it to every surgical case.

It is the duty of every conscientious operator to use all possible means to prevent infection, no matter what operation he may be performing. The same antiseptic precautions that are imperative for a simple case of labor ought to be sufficient for a case of Cesarean section or symphysiotomy. Aseptic surgery, in order to be effective, must be thorough, and there is absolutely no excuse for a relaxation of our vigilance on the ground that we just do not happen to open the peritoneal cavity.

Quite a different objection to symphysiotomy has been raised by Walcher (*Centralblatt für Gynäkologie*, 1893, No. 25), that is, the condition of the symphysis after the operation. He claims that in a number of cases the operation will result in either a loose or an ankylosed joint. The design of the symphysis, according to him, is to form with the sacro-iliac joint an elastic springy connection between the thighs and vertebral column. This is so constructed that the haunch-bones and sacrum do not move in one axis, but that the pelvic planes, *converging* from behind forward, form two coöperating axes, which for the execution of a movement require a sliding of the haunch-bones at the symphysis. If the symphysis be ankylosed, the movement of the sacro-iliac joint is lost. When this occurs the jar in walking will be directly transferred to the spine, a most important point in the movements and carriage of the patient. A loose joint lessens safety. Admitting the correctness of this theory, it is still impossible to agree that the occasional occurrence of either disorder should be taken as a serious objection to the operation. A loose joint will not infrequently result from natural labor; besides, I think that proper care and an improved technique of the after-treatment will altogether do away with this complication. In the great majority of cases reported, union took place in a surprisingly short time, and patients were able to walk with a steady gait as early as three weeks after the operation. As far as ankylosis is concerned, it is difficult to say how this could be prevented. Fortunately it seems to occur very rarely. I have not found a single case of that kind reported in the literature accessible to me.

The fundamental indication for the operation is given by such a disproportion between the head of the fetus and the pelvic diameters that delivery would be impossible without recourse to embryotomy or Cesarean section.

It would lead me too far if I should attempt a detailed description of the different kinds of contracted pelves; and I am sure it would be "carrying owls to Athens," for I am not addressing tyros in medicine now. Suffice it to say that it is principally in those varieties of contracted pelvis which are known as the flat and the rickety flat pelvis in which the operation finds its application. Next to these ought to be mentioned the generally contracted, the kyphotic, and the funnel-shaped pelvis. In the ankylotic pelvis the operation is contraindicated by reason of the immobility of the sacro-iliac synchondrosis.

The availability of the operation depends upon the length of the antero-posterior diameter of the pelvic inlet in the flat and generally contracted pelvis. In the funnel-shaped, as well as in the kyphotic, variety the length of the transverse diameter of the pelvic outlet will furnish the indication. The biparietal diameter of a full-grown child averages 9.25 centimeters, and taking into consideration its compressibility, amounting to about 6 mm., it can be reduced to 88 mm.

Now, supposing we have to deal with the pelvis having a conjugata vera of 67 mm., we must gain sufficient space by the separation of the symphysis for the passage of the head. By different experimenters it has been shown that the increase in length of the conjugata vera is one-fourth of the distance between the pubic bones, so that with a separation of 8 centimeters we should gain 2 centimeters in the antero-posterior diameter. To go beyond this limit would jeopardize the safety of the sacro-iliac joints, as has been clearly demonstrated by repeated experiments. Adding this to the original 67, and taking for granted the statement of Dr. Garrigues, who says that the head enters to the extent of about 6 mm. in the gap, we have a clear gain of 26 mm., which will give a conjugata of 93 mm. for the passage of a head, the biparietal diameter of which may be reduced by compression to 88 mm. This calculation shows that delivery can be easily effected by symphysiotomy when the true conjugate does not measure more than 67 mm. This length is now generally accepted as the lower limit at which the operation is

considered feasible. The upper limit is placed at 88 mm. by the majority of operators, while Dr. Garrigues advocates 95 mm. in a flat, and 11 centimeters in a generally contracted pelvis, on the ground that the latter offers the same resistance as a flat pelvis with a conjugate 13.5 mm. (0.5 inch) shorter.

This proposition of Dr. Garrigues is unintelligible. It certainly is paradoxic to talk of a generally contracted pelvis with a conjugata vera of 11 centimeters. The normal length of the true conjugate is 11 centimeters, therefore, with one diameter perfectly normal, a *general* contraction cannot be said to exist in such a pelvis.

It seems to me that taking the measures by Dr. Garrigues as the upper limit would mean to give a larger scope to the operation than it ought to be allowed. By early or so-called prophylactic version, many cases of labor may be terminated safely to mother and child, when the true conjugate is barely 8 centimeters in length, and, therefore, whenever practicable, it ought to be resorted to in preference to symphysiotomy. Still, in my opinion, it would be premature to give a final decision in regard to this point. Possibly, after some time, when the comparative safety of symphysiotomy will have been demonstrated beyond the possibility of a doubt, there may be a change in the opinion of those who caution against a too liberal use of the newly-revived operation.

In the rarer forms of contracted pelves, known as the kyphotic and the funnel-shaped pelvis, we find the principal shortening in the transverse diameter of the pelvic outlet, either alone or combined with a shortening of the antero-posterior diameter; while the pelvic inlet remains normal, or pretty nearly so. It is in this kind of pelvic contraction that symphysiotomy will be more useful and effective than in the varieties mentioned, because of the direct ratio which the increase in the length of the transverse diameter bears to the amount of diastasis of the pubic bones; in other words, every inch of separation means an additional inch in the length of the diameter.

The upper limit for the indication of symphysiotomy in these cases I should place at the same degree of contraction in the transverse diameter of the pelvic outlet that was decisive in the conjugate of the flat pelvis; because the proportion between cephalic and pelvic diameter remains the same, the transverse diameter of the pelvic outlet corresponding exactly to the antero-posterior of the pelvic inlet in a normally-developed pelvis. As to the lower limit, I think it could safely be placed below sixty-seven mm., if such an amount of contraction should ever occur. Supposing we had to deal with a transverse diameter of six centimeters, a diastasis of five centimeters would be sufficient to restore the normal length.

Besides the foregoing there are other indications for symphysiotomy. Thus it has been performed for the removal of a tumor from the pelvic cavity, and has been proposed for impacted mento-posterior face-presentation. Albaran reports a case in which he did the operation successfully in order to facilitate the removal of recurrent epithelioma of the bladder. An abnormally large head would furnish another indication for the operation.

There are two methods of operation in use, the subcutaneous and the open,—the first advocated by Morisani, the second by Pinard. Either method has its advantages and its disadvantages. For the open method it is claimed that one can see exactly what he is doing, and in case of hemorrhage have easier control over it. The subcutaneous method has the undeniable advantage of a smaller wound. I should prefer the subcutaneous method for those cases in which the joint takes a straight course and can be easily divided with the knife, while the open method would be preferable when, in the presence of a zigzag line of the joint or of ossification, the chain-saw would have to be employed. Still, in the absence of a larger experience, I must leave the question *sub judice*.

Leopold and others teach that the division of the subpubic ligament is useless after the joint has been opened, and that therefore this structure ought not to be cut. This may possibly be good practice in cases of flat pelves in which we only have to deal with an abnormally short conjugate, but I fail to see what we can gain by his method in those cases in which the transverse diameter of the pelvic outlet is contracted. It is evident that a separation of the upper ends of the bodies of the pubic bones, while the lower ones are still being firmly held together at the vertex of the pubic arch by the subpubic ligament, could only result in a further approximation of the tuberosities of the ischium, if they could follow the strain brought to bear upon them by a forcible separation at the upper end, and therefore I think that these cases imperatively demand the division of the ligament. Besides, general experience seems to contradict Leopold's view.

The patient is to be placed in the lithotomy-position, with the flexed thighs gently abducted, and then an incision of variable length is made, according to the method chosen for the operation. For the subcutaneous, a longitudinal incision three or four centimeters in length is made in the median line, terminating about one centimeter above the symphysis. After the division of the pyramidalis muscle the finger is introduced to the lower end of the symphysis, and under its guidance the joint is cut through with a probe-pointed bistoury, from

behind forward and from below upward. For the open method the incision is begun about two centimeters above and in front of the symphysis, is carried down to the root of the clitoris, or is made to deviate to the left of that organ and continued into the vulva between the labium majus and minus. The joint may then be opened by cutting from without inward and from above downward, or in the manner described. The wound in either case ought to be well protected with a pad of iodoform-gauze. After delivery, which may be effected by expression or the forceps, the wound ought to be carefully closed by close silkworm-gut sutures (which ought to be passed deeply enough to include the sinewy tissue in front of the pubic bones) and covered by an occlusive dressing.

During the act of severing the subpubic ligament the hip-bones ought to be well supported, lest separation take place too suddenly. If this is neglected, the pubic bones will suddenly be thrown widely apart with an audible sound, and laceration of adjoining structures may easily take place. A catheter in the bladder will be useful in keeping it out of harm's way. I am very much inclined to think that the omission of these very important precautions has been the cause of a number of accidents so far reported.

As far as suturing the bones with silver wire is concerned, as recommended by some surgeons, I think it objectionable on the ground that in case of a possible future operation these very sutures would increase the difficulty of opening the joint; besides, it seems to be the consensus of the majority of operators that union will readily take place without any bone-suturing. To facilitate this union a tight bandage may be passed around the hips, the limbs brought together and the patient placed on a so-called trough-bed, as suggested by Dr. Robert L. Dickinson, of the Long Island College Hospital, and described in the *Medical Record*, 1893, vol. lxiv, No. 22. A long and moderately hard pillow is placed on each side of the mattress, over which is spread a rubber sheet and other sheets above it. On this trough the patient will lie in such a fashion that the weight of the lower part of the trunk and thighs is received on the iliac crests and trochanters. The legs are rotated inward, the knees pressed together, and the tendency to separation of the symphysis is overcome, as it occurs when the weight of the body is borne on the sacrum.[1]

The principle on which this simple device is planned is certainly excellent, although there is room for certain modifications in the arrangement of the practical details of the apparatus. Thus, I should suggest the use of wedge-shaped upholstered cushions with an inclination of about 45°, which could be fastened on a light wooden frame in such a fashion that they could not be shifted in a lateral direction by the weight of the patient, according to whose size the distance between the two sides should be regulated. In this way the patient could be lifted or entirely removed from the bed without causing the least motion in the pelvic joints.

Dickinson, in the article referred to, calls attention to the fact that in his case the peritoneum and bladder pouched into the wound, and proceeds to show at what stages of labor this complication was likely to occur. From a study of frozen sections of women who died late in pregnancy, and at different stages of labor, as given in *Braun's Atlas of Topographic Anatomy*, and in *Barbour's Atlas of the Anatomy of Labor*, we come to the following conclusions:

The structures found behind the joint will be:

(1) Before full dilatation and a certain degree of descent: The peritoneum and bladder in the cavum Retzii.

(2) After full dilatation and some descent: The lower part of the bladder and urethra firmly pressed against the joint.

(3) After delivery: The peritoneum and bladder.

The bloodvessels that are located behind the lower part of the symphysis in the cavum Retzii will be found beneath the arch during labor, and, with few exceptions, after delivery they are still in the same position.

The practical conclusion to be drawn from these anatomic facts is that we must expect to find the bladder and peritoneum behind the joint in all cases in which the conjugata vera is shortened, in consequence of which the head cannot engage in the pelvis, and in which full dilatation has not taken place, while in those cases in which the head has descended in the true pelvis, but cannot be born, owing to a contraction of the pelvic outlet, the peritoneum and upper part of the bladder are pushed above the symphysis, and only the lower portion of the latter with the urethra are in close apposition with it. It is evident that under these conditions there is greater danger of wounding any of these organs than in the first-mentioned cases, in which the peritoneum and bladder could be easily held out of harm's way with the finger. The clitoris may be lacerated by a sudden separation of the joint because of the attachment of its crura to the rami of the pubes and ischium, an accident that would be followed by troublesome hemorrhage, and, therefore, great care ought to be exercised to prevent the occurrence of this mishap.

I am unable to explain the presence of bloody urine, which has been observed in some instances after symphysiotymy, without advancing the theory that laceration of the mucous membrane of the

[1] There is a little room for the bed-pan to be slipped beneath the patient while the inward pressure still continues.

deeper portion of the urethra may take place in consequence of violent stretching of this canal. If it were caused by an incised wound in the bladder, extravasation of urine in the pelvic tissues would naturally complicate the accident.

In order to illustrate the various ways in which the operation may be complicated I shall cite a few cases taken at random from the accessible literature:

In *Centralblatt für Gynäkologie*, 1893, No. 5, page 81, Krassowsky reports a case of symphysiotomy in a deutipara with a conjugate of eight centimeters, in which there was considerable hemorrhage from the cavernous body of the clitoris; the right iliac synchondrosis was heard to rupture; cystitis followed; there was slight mobility of the symphysis after recovery.

Smyly (*British Med. Journal*) reports a case in which the bones, separating rapidly, tore the soft parts beneath the urethra; the laceration was repaired with catgut; besides a bedsore a urinary fistula developed, which was cured by a second operation.

Kein (*Gazette de Gynécologie*, 1893, No. 16) reports a case in a multipara on the third day of labor, in which the pelvis was narrowed by fibroids of the sacrum and pubes. There was a purulent vaginal secretion. The patient made a good recovery although two abscesses formed at the ends of the incision.

Bidder (*Centralblatt für Gynäkologie*, 1893, No. 24) reports the case of a primipara, eighteen years old, in which a purulent discharge appeared. The left labium near the clitoris contained a broad tear, which was repaired with silk. Endometritis and a stitch-hole abscess delayed recovery. There was a furrow visible on the surface, as the bones had not entirely united. After five weeks the patient was discharged from the maternity hospital.

In a case reported by Maygrier, in the same journal, symphysiotomy was done for dystocia caused by a periosteal tumor on the left side of the symphysis. After prolapse of the cord and one arm, embryotomy was performed; the anterior vaginal wall was torn to the extent of five centimeters. On the second day the patient suddenly died from a clot in the right pulmonary artery; the symphysis was separated only 2.5 centimeters.

Tellier reports a case in a primipara, twenty-seven years old, in which the perineum, bladder, and urethra were torn, and the patient died from shock two hours later; the child survived.

Lepage (*Centralblatt für Gynäkologie*, 1893, No, 20) performed symphysiotomy for dystocia, caused by a round tumor on the left side of the pelvis, with a favorable result.

Wertheim, in the same journal, reports a case in which the patient died on the eleventh day of sepsis, due to infection previous to operation. There was considerable odor to the liquor amnii.

Coe (*Medical Record*, 1893, No. 1172) reports a case in a patient with a contracted pelvis and deficient in mental development. She recovered from the operation, but died two months later demented. Union between the bones was firm.

In consideration of the fact that dementia has sometimes followed an otherwise normal delivery, this one case can hardly justify the conclusion that the operation was the cause of the mental disturbance. It is true that after some cases of ovariotomy dementia has also been observed; but the effect of the removal of the ovaries upon the whole organism must necessarily be so entirely different from that of a simple and only temporary separation of the pubic bones that a comparison of the two operations in this respect is absolutely inadmissible.

The case that I now report is one of those rare exceptions in which the difficulty in labor will be met with toward the pelvic outlet, owing to a contraction of the transverse diameter.

The patient was a primipara, twenty-eight years of age, below the medium size (a Jewess, of German ancestry, born in Rochester, New York, now living in San Francisco). I was called to see her in consultation with Dr. Dodel on the afternoon of January 13, 1893. She had been in labor for about twenty-four hours, and was showing signs of exhaustion. The fetal heart-sounds were strong and regular. The head presented in the first position, and had descended deeply in the cavity of the pelvis. The examining finger could reach the anterior fontanel. The uterine contractions had almost entirely ceased, in spite of the usual remedies employed for bringing on labor-pains.

Owing to the weakened condition of the mother, it was deemed advisable to terminate labor by the use of the forceps. After the patient had been anesthetized I introduced the hand in order to apply the forceps, but found it extremely difficult to gain an entrance into the vagina. It was only after considerable effort that I finally succeeded in forcing my hand inside, but by doing so I found that I had not made much progress, for it was impossible to introduce even the first branch of the instrument, and at the same time I felt in a painful way how the descending rami of the pubic bones impinged upon my hand, holding it in a vise-like grip, and forbidding any freedom of motion. The truth of the old saying, "Manus est optimus pelvimeter," never struck me so forcibly before, when it became clear to me that I had to deal with a funnel-shaped pelvis. On withdrawing the hand I found that in my efforts to gain an entrance into the vagina I had caused a laceration at the introitus vaginæ and ruptured the perineum, which gave rise to considerable hemorrhage.

After packing with iodoform-gauze in order temporarily to check the hemorrhage, I proceeded to perform symphysiotomy in full accord with the opinion of my colleague.

In the absence of sufficient assistance it was deemed advisable to make use of a leg-holder, the patient being brought to the edge of the bed and placed in the lithotomy-position. The joint was opened according to the subcutaneous method, and the bones separated suddenly and with an audible sound as soon as discission was complete. It was necessary to use the forceps to effect delivery, and a considerable degree of traction was necessary to accomplish this end, owing to incomplete dilatation and rigidity of the cervix. The distance between the pubic bones during extraction I estimated to be about five centimeters. The silkworm-gut sutures used to close the wound were passed as close to the bones as possible, and a long roller-bandage, about four inches wide, was used to bring together the hip-bones, over which was applied on the next day an

elastic rubber bandage. The wounds in the vaginal wall and perineum had also been repaired with silk-worm-gut.

The patient passed bloody urine on the following two days, and later it became purulent; but after washing the bladder several times with a 1 per cent. solution of silver nitrate this soon ceased. She made an uneventful recovery, and in spite of a narrow furrow which is palpable over the symphysis, her walk is perfect. She left the bed four weeks after the operation. The child is strong and healthy.

In this case the operation had to be done under the most unfavorable conditions imaginable. The room was dark, and a small oil-lamp, together with a couple of candles, without candlesticks, were all that was available for illumination. The bed was so dilapidated that it broke down before the work was done and the child had to be extracted, the mattress on which the patient rested being on the floor. Of assistants I had just one—my son, a medical student in his second year. Dr. Dodel had charge of the anesthesia. It was only with difficulty that we could obtain the necessary amount of hot water for preparing our antiseptic solutions and so on.

This case has taught me the lesson that it is not safe to depend on the use of a leg-holder alone when doing symphysiotomy, but that at least one more assistant ought to be secured, whose part it would be to prevent a sudden separation of the pubic bones by making a certain degree of counter-pressure against both hip-bones, for I feel satisfied that the hematuria was caused by some sort of laceration taking place in the deeper portion of the urethra, or the lower part of the bladder, in consequence of this sudden separation.

In the absence of a pelvimeter there was no possibility of ascertaining in figures the length of the different pelvic diameters which are of obstetric interest.

Since the convalescence of the patient I have taken some measurements with the following results:

Conjugate vera, 10.8 centimeters.

Transverse diameter of outlet, 9 centimeters.

Antero-posterior of outlet, 11 centimeters.

The length of the conjugata vera is of no interest in this case except to show that it came very near the norm. The principal difficulty was caused by the shortness of the transverse diameter of the pelvic outlet. For securing this measurement Breisky's method was used, as well as Schroeder's, both measurements giving the same results.

In view of the fact that a narrow furrow was palpable over the whole length of the symphysis the conclusion is inevitable that a permanent increase in this diameter must have resulted from the operation. I am inclined to think that originally it was not much above 8.5 centimeters.

The final conclusions to be formulated from this paper would be that:

1. Symphysiotomy is indicated in flat pelves with a conjugate of from 67 to 88 mm.; in funnel-shaped pelves with a transverse diameter of pelvic outlet of 88 mm. or less; in cases of dystocia caused by tumors in the pelvic cavity; in cases of abnormal size of the fetus, but with normal pelvis; and that it finds a useful application in the removal of tumors of the bladder and pelvis, provided the age of the patient does not present a contra-indication; but in those cases in which prophylactic podalic version is still possible, this ought to be preferred to symphysiotomy, even in a pelvis with a conjugate of not more than 8 centimeters.

2. It should replace Cesarean section and embryotomy whenever these are indicated within the lower limit of contraction.

3. The results are favorable to mother and child.

4. The operation is easily performed. Besides an obstetric outfit all that is needed is a surgical pocket-case.

5. It can very well be done outside of maternity hospitals. The after-treatment offers some difficulties in private houses.

6. Although comparatively safe, the operation may, in the hands of the inexperienced, be followed by serious accidents; it therefore ought not to be done lightly without an imperative indication.

7. As it is an operation of urgency, like tracheotomy, every physician should be able and ready to perform it.

THE SURGICAL TREATMENT OF INGUINAL HERNIA.[1]

BY HENRY O. MARCY, M.D.,
OF BOSTON, MASS.

IN order that we may the better understand the varying conditions presented in operative cases of inguinal hernia, I shall first ask you to review with me the anatomic structures in their normal development. The anatomic plan of construction of the parts in the transmission of the spermatic cord and vessels through the abdominal wall is by a line so oblique that the intra-abdominal pressure is normally placed at or near a right angle to the axis of the inguinal canal. However singular it may seem, I do not remember to have found a single reference made to this anatomic disposition of the structures in its possible application to the cure of hernia. This is, very probably, because the restoration of the parts to their normal anatomic relationship was impossible without the use of buried sutures.

In the upright position the weight of the abdominal contents is deflected forward by the promontory of the sacrum, in a way to lessen greatly the gravity-pressure upon the pelvic organs. The recti

[1] Read before the Annual Meeting of the New York State Medical Association, 1894.

muscles form a strong supporting column with their basic anterior pubic attachment. Muscular strain, brought to bear with any degree of violence upon the abdominal wall, causes a deflection of the compression-force in nearly equal degree from the promontory of the sacrum, upon either side, to the aponeurotic attachment of the muscles to the pelvic bones. Thus it would seem that when the normal conditions obtain, this force must ever act in right lines to the inguinal canals. Were it not for this it would be difficult to understand why the normal condition of man, as an upright animal, should not be that of a hernial protrusion of the abdominal contents along the lines of a necessarily open inguinal canal.

Perhaps we are more deeply indebted to Sir Astley Cooper than to any other for pointing out this remarkable provision of nature for the production and maintenance of this normal equilibrium of function and retaining force. He demonstrated that the transversalis fascia lying immediately beneath the peritoneum was normally so reinforced and strengthened as to form a strong posterior wall to the inguinal canal, and that it also, by the dissemination of its fibers about the cord, made a firm boundary to the internal ring, thus producing a fixation-point of definite character for the exit of the cord from the abdominal cavity.

Tracing the developmental forces during the late fetal period, we note the interesting and remarkable process of extrusion of the testicle from the abdomen, and the carrying with it of the peritoneal covering investing its vessels and vas deferens, making up the so-called spermatic cord. Normally, the peritoneum is so closed in about these structures at its exit from the abdomen that only by pulling upon the cord do we note the slight depression upon the peritoneal surface which lines the abdomen at this point. Not seldom, however, in individuals who are not subjects of hernia, the transversalis fascia about the internal ring is more open than normally, and the peritoneum, shutting in about it, is left in a considerable depression. Indeed, this condition exists so frequently that it has received the name of the infundibular process of the peritoneum. These are the conditions which are very commonly present as predisposing factors in all subjects of hernia.

Remembering the disposition of the intra-abdominal pressure as already noted, it is easy to understand that when this condition exists there is brought to bear upon the depression, in every movement of the body, a more or less powerful hydrostatic pressure upon this weak point, acting as a wedge, until at last the equilibrium of the forces is so disturbed that, little by little, the parts yield, the internal ring enlarges, the inguinal canal is by this much shortened, until by some extra force the external structures suddenly give way and the man finds himself ruptured—that is, a portion of the abdominal contents has become displaced through an abdominal opening.

I have presumed to occupy thus much of your attention in the consideration of the normal anatomic relations and functions of the parts involved in inguinal hernia, because this knowledge is especially important to the surgeon who, by operative interference, expects to secure a permanent restoration of the weakened structures, rather than to qualify himself only for the relief and restoration of the abdominal organs in strangulation.

The time at my disposal prevents a careful analytic discussion of the varying conditions that may be met with in the cases presenting themselves for operation, but assuming that we may favorably consider the subject of a hernia, who is otherwise healthy, a proper applicant for surgical relief, we shall take first into consideration those cases coming to us in infancy and childhood, the larger number of which will be of the congenital variety. Here it is well to remember that we have no hernial sac proper with which to deal; in other words, the scrotal pouch of the peritoneum containing the testicle is in direct continuation, as an open canal, with the abdominal cavity. We find usually that the opening in the transversalis fascia is very large, and the surgical procedures are not unlike those recommended for the restoration of the obliquity of the inguinal canal in cases of acquired hernia, after the peritoneal sac containing the hernial contents has been sutured and resected.

The dissection is commenced at a point a little above the internal ring, and is carried down sufficiently far on a line with the cord to expose clearly the internal ring. The structures over the cord are divided so that the latter can be elevated and clearly expose the border of the internal ring and the posterior wall of the cord. Either by finger, or some convenient instrument, an assistant holds the cord, freed from its attachments, toward the middle line with sufficient tension to define clearly its relationship with the deeper structures. This is done in order that a clear field may be had for the application of the sutures for the reinforcement and reconstruction of the posterior wall of the canal. For the accomplishment of this it is absolutely essential to use sutures that are buried in the structures, and are, as a consequence, beyond the power of the surgeon for subsequent removal. By general consensus of opinion, silk, although it may be used as a buried suture, is not considered applicable for this purpose. For somewhat similar reasons silkworm gut proves unsatisfactory, because both of these materials, not being absorbed, are liable as sutures to prove irritants, and, in the sub-

sequent muscular strain of the parts, are thrown off as foreign bodies. Good chromicized sterile catgut may serve as a trustworthy material for suture, but for a considerable variety of reasons, which cannot be referred to here, it has proved far inferior as a buried suture to tendon, preferably that from the tail of the kangaroo.

The way in which the suture is applied for the reinforcement of the parts, and the structures to be included for this purpose, vary considerably. I have felt for a long time that a double continuous suture is to be preferred, and for this reason devised the method of sewing in which the suture is applied by the use of a curved needle with an eye near the point. The first stitch is taken by entering the point of the needle through the lower border of the attachment of the conjoined tendon and the inferior posterior border of Poupart's ligament. The needle is unthreaded, the suture centered and tied in a half-knot, the needle rethreaded with the opposite end of the suture and withdrawn through the opening made at its entrance. Continuous sutures to the number of three or four are applied in this way until the last stitch closes firmly the inferior border of the internal ring quite upon the cord at its exit from the abdomen. The last stitch taken, the suture is tied upon the side and the ends cut short. It must ever be remembered that the object of the suturing is to hold the structures in even approximation without tension, and the chief danger from suturing lies in an *undue constriction* of the tissues. When properly applied, it will be observed that the transversalis fascia has been reinforced by the attachment of the posterior border of Poupart's ligament to the posterior border of the conjoined tendon, thus forming a new strong wall of the inguinal canal. Into this slit the cord is replaced and the external structures are joined so as to make a firm, strong closure of the parts over the cord. For this purpose buried tendon-sutures are equally desirable. These may be applied, as already described, by a line of double continuous suturing, re-forming the external ring by bringing together the outer border of Poupart's ligament and the conjoined tendon.

For one who does not possess a needle such as that described, the single continuous suture, applied with a curved Hagedorn needle, answers very well. The first stitch should be fixed by a reef-knot, and the needle is then inserted at a more or less considerable distance from the line of the division, but taken deeply through the aponeurotic structure on a line *parallel* to the incision. The needle is then introduced exactly opposite its point of former emergence through the structures upon the other side of the parts to be approximated, and in this way one stitch follows another to the end of the wound. It will be noted that tension upon the suture evenly intrafolds the edges, the suture itself, buried in the tissues, crossing the line of division only at right angles. In this way the line of union is very much deepened, and may be easily more than doubled, greatly reinforcing the structures adjacent to the canal. Another layer of sutures, similarly applied, approximates the soft parts, and a line of running sutures, taken through the deep layer of the skin only, closes the wound. This is dried and sealed with iodoform-collodion. No subsequent dressing or bandage is applied. The tunica vaginalis testis is thus reformed, and the peritoneum closed securely about the internal ring so as to leave no depression.

The opposite extreme, the old large hernia in the adult, requires little deviation from the method described, except that the sac is first dissected free from its attachments, opened, to be assured of its contents—which may be disposed of as judged best, and then, quite within the ring, the sac is freed from adhesions and made tense by an assistant. The base is sewed across with a double continuous suture in a line with the axis of the wound, and the sac is resected. The retraction should be quite sufficient to place it out of the way in the subsequent steps of the operation, which are those that have been described for infantile hernia.

For teaching purposes I like best the large old scrotal herniæ, in which trusses have proved inadequate for the retention of the abdominal contents, since the various steps of the operation can be made more easily apparent.

Inguinal hernia in the male has ever been considered the most difficult of treatment, since the opening in the abdomen must be closed in a way to permit the passage of important structures, which, at the best, can add nothing to the support of the parts. In the seventeenth century it was found an easy matter to cure inguinal hernia by first removing the cord, and great numbers of hernia-patients were deliberately castrated as a means to this end. More recently, before an open dissection-wound was considered permissible, a great variety of ingenious subcutaneous devices were applied for the purpose of cure, but were usually followed by failure. Since it has been possible to make and maintain wounds in a non-infectious condition the advance toward the permanent cure of hernia has been rapid, until, in very recent years, new methods of cure are being constantly brought before the profession. However great in variety of detail, they must all be based upon a very few fundamental principles, and, in order the better to emphasize these, I have occupied so much time with the consideration of the normal anatomy of the parts involved.

Of course, the *ideal* method is to restore the parts to the normal standard of construction; pathologic deformed structures having been removed, *e. g.*, sac

and contents. To do this, it is necessary to restore the obliquity of the inguinal canal by the reconstruction of the internal ring, and to reinforce the posterior wall. To effect this, a free dissection must be made, and buried sutures must be used. It was for this very purpose, so far as the records of surgery show, that buried sutures were first employed. I had just returned from Europe and the instruction of Mr. Lister, and was familiar with the use of the buried animal ligature for the closure of arteries. It seemed a proper application of the principle that sutures might in like manner and with like result be buried in the tissues. For this purpose I first used catgut in 1870, which, prepared in various ways, I continued to use until 1880, when I made an extended search for some better material of like histologic structure. These investigations resulted in finding the exceptionally valuable tendon suture-material from the tail of the kangaroo. I demonstrated, histologically, that aseptic connective tissue, buried in healthy animals, is at first surrounded by leukocytes, that the foreign material is invaded by them, that, little by little, new connective tissue of a permanent character replaces the implanted suture. Since then I have used tendon-sutures almost exclusively.

It has been demonstrated that other material may be used for sutures, and that it may be applied in quite a variety of ways. These variations in detail and technique have been called *methods*, and have been presented under different names, *e. g.*, that of Bassini of Italy, perhaps the best known. He uses an over-and-over continuous catgut suture, and places the coapted conjoined tendon and Poupart's ligament behind the cord. Potempski thinks it important to carry the internal ring to a higher point than normal. Fowler modifies this procedure by carrying the internal ring nearer to the median line, while Halsted thinks it wise to cut away a part of the veins in order to reduce the size of the cord, and, as a consequence, the size of the canal. It remains to be seen how much additional value comes from these modifications; if the liability of the return of the hernia is lessened, and if, by such extreme measures, the function of the reproductive organs is not impaired.

It is ever honorable and pleasant to associate the name of the individual with the contribution of real merit which he makes as an addition to the store of the world's knowledge. However, little by little, names given to operations after the individual by whom they were established sink into forgetfulness, and wisely so, that they may not overburden our literature; but the plain underlying principles must ever be kept in mind as the true foundation of all present and future improvement.

For the cure of hernia by a restoration of the structures to their normal anatomic standard and relationship—and is it probable we shall find a better?—I introduced the use of buried animal sutures, which has been since widened in its application to all aseptic wounds. I demonstrated that a new oblique inguinal canal could be safely made and maintained; that the entire wound could be closed by buried sutures and sealed with collodion without drainage; and that primary repair ensued without pain or edema. I also showed that 90 per cent. of my cases remained permanently cured; all this before any of the modifications referred to were published. Whatever may be their advantages remains for others to determine. I know that the reinforcement of the structures posterior to the canal is ample, if the inner border of the conjoined tendon and Poupart's ligament is joined to the relaxed, but strongly developed, transversalis fascia. This fascia is very much thicker in this region, as was pointed out by Sir Astley Cooper, and for a long time, on this account, called the *fascia Cooperi*.[1] Often its intrafolding is all that is requisite to give a firm and durable support.

The introduction of animal sutures, aseptically buried in the tissues for a very great variety of purposes, especially the possibility by their use of the closure of the peritoneum and the reconstruction of the inguinal canal for the cure of hernia, I offer as a contribution to American surgery. It is with much satisfaction that I find that these surgical measures are now so very generally adopted throughout the civilized world.

Before closing, there are a number of practical considerations which are offered for discussion. Of these perhaps the first in importance is, When shall we operate? At present I suppose there are few surgeons who would dissent from the proposition that, in strangulated cases, always at the first moment practicable. Any attempt at reduction should be made with exceeding care, and after such efforts have failed immediate operation must be advised.

Operative measures for the relief of strangulated hernia vary essentially from those earlier advised in that the dissection is a free one and is always under visual guidance; that blind surgery is bad surgery can nowhere receive greater emphasis than in the operation for the relief of strangulated hernia.

The hernial contents having been disposed of,

[1] Muscular fibers may be traced behind the cord, as if the canal entered through a slit in the transversalis muscle. "The transversalis muscle arises from Poupart's ligament and passes around the spermatic cord at the internal ring, so that the fibers of this muscle appear behind as well as before the spermatic cord, and thus the inguinal canal is rendered a muscular canal. This is a most important provision in preventing hernia, and when hernia exists, is often the cause and seat of stricture."—*Sir Astley Cooper.*

few operators would now consider their work complete without closing the structures in some of the ways advised for the purpose of permanent cure. The earlier attempts made to utilize the sac for the reinforcement of the opening—as, for example, the Macewen method—are now very generally abandoned, since the reinforcement of the structures posterior to the cord, in a very much more satisfactory manner, closes the weakened parts.

Hernia in children. Until a moderately late period nearly all this class of little sufferers have been relegated to the instrument-makers. However, every surgeon is painfully familiar with the fact that it is exceptionally difficult to secure the proper wearing of a retention-apparatus, and that, at the best, the cure of hernia by these means is tedious, painful, and unsatisfactory. The earlier attempts at cure of hernia by dissection and suturing were in large measure unsatisfactory, because of the use of the interrupted suture, which had to be removed, and the extreme difficulty of keeping the wound aseptic on account of the application of the drainage-tube. It is painful to recall the punishment of the little sufferers because of the multiple aseptic dressings, sometimes held in place even by plaster bandages. With all the care possible, the great majority of the wounds became infected, dangerous, and far from satisfactory in results.

The closure of the parts, as already described, with the seal of collodion, renders further infection impossible, and primary union supervenes without pain or edema, resulting almost invariably in permanent cure. It is pitiable in the extreme to send a boy, rich or poor, into the race of life suffering from hernia, and handicapped with the necessary wearing of a truss.

Hernia in adults. It may be considered an open question if active, vigorous men who are sufferers from small herniæ, easily retained by a truss, should be subjected to a surgical operation. The expense incident thereto, the loss of a number of weeks during which they must abstain from business, are set over against the inconvenience of wearing an instrument, the probability of the hernia continuing to grow more troublesome and pronounced, and the ever-possible danger of strangulation. For my own part, I think the balance of account is usually in favor of operation, and I cannot question that the profession is each year becoming more and more of this opinion.

Hernia in the aged. As at other periods, the problem must always be considered as one of individual character. This becomes more especially so in the later years of life. Assuming that the hernial subject is free from organic disease, age *per se* weighs far less seriously as an adverse consideration in aseptic surgery than was earlier supposed. Primary repair of the tissues is almost certain to ensue with remarkably little constitutional disturbance. The contrast between septic and aseptic wounds is much more marked in advanced life, and aseptic surgery wins, perhaps, its most brilliant victories in the operative wounds upon the aged. I have operated upon a very considerable number of patients between seventy and eighty, under the most unpromising conditions, and even upon several between eighty and eighty-five, and in each instance with seeming easy cure.

In illustration, I cite a recent interesting case, and exhibit the specimens.

Mr. M., aged seventy-one years, a hard drinker, had for a very long period suffered from an old irreducible scrotal hernia of the right side. It had recently enlarged until the tumor extended quite one-third to the knee and measured about eighteen inches in circumference. An inconsiderate truss-vender had applied a strong-spring instrument upon the neck of the sac, and such inflammation had supervened that it was thought dangerous to permit delay in operation. The tissues were ecchymosed, and the sac was found to contain about a pint and a half of straw-colored serum and a fatty omental tumor the size of an adult fist, with basic attachments. The omentum was sewed across, resected, and returned within the abdomen. Several pints of ascitic fluid escaped from the canal, which readily admitted three fingers. The sac was dissected, sutured, and removed. The wound was closed, as already advised, and sealed. The man was found to have chronic nephritis, with albumin and casts in the urine, and jaundiced to a limited extent. This condition grew steadily more marked, and twenty-six days after the operation death took place.

The autopsy showed an interstitial hepatitis, the liver being reduced to half the normal size, with advanced disease of both kidneys. The union of the abdominal wound was primal, and I take pleasure in inviting your critical inspection of the specimens. The omental stump is smooth and the cut ends of the tendon-suture are apparently unchanged. The peritoneum at the base of the sac is firm and glistening, showing only the slight wavy line of union. The reconstructed abdominal wall is noteworthily deep and strong, nearly one-third thicker than upon the opposite side, owing to the intrafolding of the tissues. The skin-wound is marked only by a linear cicatrix. The fatty tumor of the omentum is exceptional, seeming on section to bear no trace of intrafolded compressed omentum, of which it is doubtless composed; the thick, firm, leathery sac can even now be dilated to the size of a baby's head.

It will be noted that even in this aged man, dying from a complication of chronic diseases, the repair-processes, under aseptic conditions, went on uninterruptedly, precisely as in a young, vigorous adult.

Multiple operations. Individuals with hernia, suf-

fering from various other conditions demanding surgical interference, may, as a rule, be safely operated on at the same time. It is usually advisable to operate upon both sides at once when the hernia is double, the repair-processes going on equally well, with a marked saving of time and confinement. I have even operated upon double inguinal and umbilical herniæ at the same time, with an equally easy convalescence and recovery. Multiple wounds, if aseptic, demand little more from the vital powers during the process of repair, and there is much positive gain to the patient in time, expense, and confinement. Multiple operations have long been almost of daily occurrence in my surgical practice.

If operative measures are so generally advised for this disablement, it must be that the surgical procedures are attended with very little risk of life. Upon this subject the testimony is ample, and perhaps no other operation demonstrates more clearly the differences of result obtained under modern aseptic technique. Nearly twenty-five years ago, when I first commenced operation for the cure of hernia, it required persuasion to secure the presence even of physicians, because of the responsibility incident to personal attendance. So general was the belief—and, unfortunately, on altogether too good evidence—that an open dissection-wound made for the cure of hernia was always dangerous, that operation was not advised except in cases of strangulation.

In my recent work upon hernia,[1] I have collated over three-thousand operative cases of hernia by various aseptic surgeons, who report less than one per cent. of deaths, and these explained by conditions in which the wound itself had no part. In my entire experience of over two-hundred cases I have never seen a patient approach the danger-line following operation when the intestines were not involved.

He who is master of aseptic conditions may safely operate for the cure of hernia, if he is thoroughly conversant with the anatomy of the structures. *Aseptic sutures, aseptically applied in aseptic wounds,* and aseptically maintained. This is the *sine qua non,* or failure will ensue; otherwise buried sutures are not to be commended in any wound, and must even be a source of danger.

In how large a percentage of cases may we expect permanent cure?

Upon this question there has been and still is a great variety of opinion, based upon the results, of course, obtained from the various methods of operation in use. We can well understand the opinion as given by Dr. Bull, of New York, that relapses are the rule rather than the exception, when we remember that the results of the operations that came under his observation were due to methods that failed to secure the restoration of the obliquity of the canal, or the reinforcement of the deep structures. The removal of the sac and the suturing of Poupart's ligament to the conjoined tendon, without the re-formation of the inguinal canal, necessarily left a large funicular opening in the abdominal wall, the very end of which only was closed at the external ring. Under such conditions, it is usually only a question of time before the hernia reappears.

In 1893 I read a paper before the American Medical Association, in which I gave an analysis of one-hundred-and-thirty-three cases that I had been able to keep under observation; of these there were six recurrent herniæ, four of which I have since operated upon. About one-third of this number had been under observation for ten years and more.

Did time permit, I would gladly quote from the experience of some of the recent operators, of whom, perhaps, none is more enthusiastic at the present than Dr. Bull himself and Dr. Coley, of your city.[1]

Corroboration of the principles and position that I have advocated so long is now ample, and there is little question that the more serious sufferers in the great army of truss-wearing individuals will early receive from the surgical profession easy and safe curative measures. In this field aseptic surgery has won one of the most brilliant victories of the present revolutionary period.

[1] The Anatomy and Surgical Treatment of Hernia. Illustrated. Quarto. D. Appleton & Co. 1892.

A NEW METHOD OF PEDICLE-LIGATION IN ABDOMINAL SURGERY.

BY SCHUYLER C. GRAVES, M.D.,
OF GRAND RAPIDS, MICH.,
VISITING SURGEON TO THE U. B. A. HOSPITAL, AND SURGEON TO THE CHILDREN'S HOME, GRAND RAPIDS, MICH.

THE death of a patient from hemorrhage due to faulty pedicle-deligation during the course of an abdominal operation is a catastrophe sufficient to cause the cheeks of any surgeon to pale. When all else in the technique has been perfect; when asepsis has had full sway; when there has been no particular bleeding, no shock, no complication; when the danger of subsequent peritonitis is practically *nil,* and everything bespeaks a favorable outcome, the death of a patient from the slipping of a

[1] From a recent letter by Dr. William B. Coley of New York I quote: "I have used kangaroo-tendon in 170 of my 183 cases of hernia, and have never had any trouble from it; and I believe my success was largely due to using it as a buried suture-material. No other results, here or abroad (except, perhaps, your own), show such a percentage of immediate or final cures. Of my 140 cases where the cord was transplanted I have had but one relapse—137 cases traced. In 170 cases where kangaroo-tendon was used, suppuration occurred only four times—and then superficial, outside the layer-sutures of tendon."

thread is an awful calamity, and any method by which the possibilities of such a *denouement* may be narrowed is a matter of vital interest to both patient and surgeon.

It is my purpose to put on record, for the use of the profession, a new method of applying a pedicle-ligature in abdominal surgery, by which the same not only *will not* but simply *cannot* slip.

The ligature has been employed in actual practice, with perfect satisfaction and ease of application, and has been exhibited to the members of the Grand Rapids Academy of Medicine at a recent meeting of that body.

There are four sources of danger from intermediary hemorrhage in the application of a pedicle-ligature: 1. The employment of the wrong knot. 2. The lack of sufficient force in tying the loop or loops. 3. The application of apparently sufficient force upon a pedicle while held in a state of tension. 4. A defective method of application.

1. No surgeon to-day needs to be told that the sailor-knot (also known as the reef, or square, or unslipable knot) is the one to be employed whenever even an isolated artery is to be tied. Comment on this point is unnecessary.

2. The lack of sufficient force in the tying of a ligature-loop is a real danger that should be carefully guarded against. If thought best, when a consideration of this point is under discussion, the pedicle can be ligated in sections sufficiently small to insure the operator's ability to compress adequately the included tissues.

3. Deaths have occurred from pedicle-hemorrhage after surgeons have used all the force they deemed necessary; but such force having been applied to the pedicle while rendered rigid by too great traction, the result, after the withdrawal of this traction, has been the same as when too little force has been exerted upon a lax pedicle, viz., the liberation of vessels, with the escape of blood.

4. The method heretofore employed in the application of pedicle-ligatures has been faulty in that it has always rendered possible a subsequent intermediary hemorrhage as the result of the slipping of a loop.

Even the Staffordshire knot, which was said to be perfect, has slipped, and thus permitted hemorrhage to occur.

In my opinion the Staffordshire method is vastly inferior to the one ordinarily used in this country, viz., central transfixion, linking, and tying both ways, as much more power can be employed in the latter than in the former. Of course, I am not discussing ligature-material in this contribution.

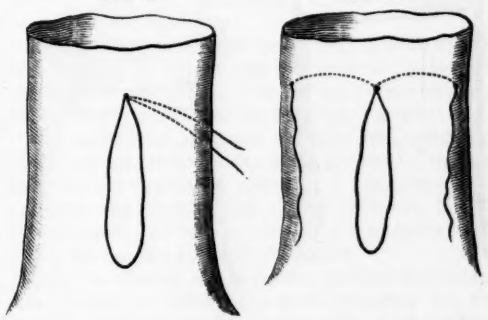
Geometrically speaking, a line (in this instance a diameter) is determined by two points, and, therefore, no looped ligature, single, double, or of the chain-variety, is safe, which is not fixed at two opposite points on the periphery of each loop, or, to be more explicit, at opposite extremities of their long diameters.

It can be said that such a condition obtains in the Staffordshire ligature, for such is, indeed, the case; but the weak point of that ligature in this connection is the fact that, in securing the two fixed points on the periphery of the main loop, two subordinate loops are made, the lateral diameters of which are almost certain to be longer than the opposite diameter of the main loop. Those familiar with the Staffordshire method will comprehend the force of this statement. The subordinate loops of this ligature are just as dangerous as the loops fashioned after the American plan, if not more so.

It is not my belief that the so-called American ligature is particularly unsafe. It is not. Deaths therefrom are rare. But it is certainly dangerous enough to warrant improvement, if improvement be possible. That it is possible I leave the reader to judge.

The old method is strong in this respect: that the ligature can never slip entirely away from the pedicle, for it has a fixed point at the center of the same; and this can also be said of the Staffordshire ligature, for I am now discussing the ordinary, double-looped ligature as described; neither can it slip when the distance from the loop to the section is greater than, or even the same length as, the diameter

FIG. 1. FIG. 2.



of the loop. These considerations, however, could have no weight with a single-looped ligature, and they are not simple enough, not accurate enough, for universal use. The security of a pedicle-ligature should not depend upon the distance, long or short, from the planes of its loops to the point of section.

The accompanying drawings are self-explanatory. The loops, it will be seen, are fixed by passage through the substance of the pedicle at points on opposite ends of their long diameters, viz., in the center and circumference of the pedicle.

Any bleeding from the transfixions, and some

does occur, may be disregarded, for all vessels of respectable size are included in the loops, or it can be readily checked by throwing a loop from one of the remaining ligature-threads around the entire pedicle and tying the same, as per drawings.

FIG. 3.

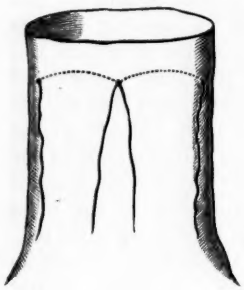


FIG. 4.

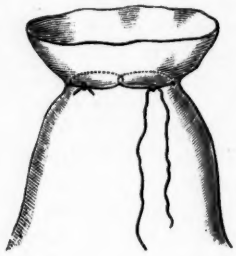


FIG 5.

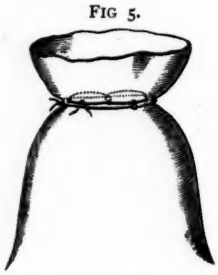


FIG. 6.

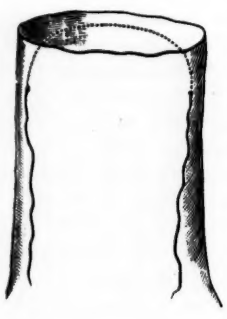
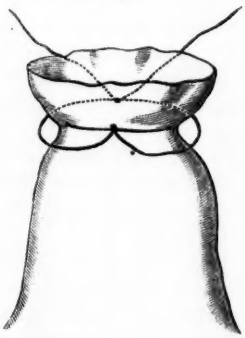


FIG. 7.



This long loop would, of course, have only *one* fixed point, and, therefore, might possibly slip; but such an accident is not at all likely to occur—not as likely as with the loops of the old ligature—because the thread lies in natural grooves rendered possible by the traction of the primary loops at the points of peripheral penetration, and even if slipping *should* occur, the danger would be practically nothing, on account of the insignificant size of the involved vessels.

Finally, if an operator, when he has occasion to deal with the pedicle of any variety of tumor, or with the bases of degenerated or suppurative tubo-ovarian masses, will, *first*, make use of the reef-knot in connection with his ligature; *second*, employ sufficient compressive force in his application of the same; *third*, be sure that the tissues to be ligated are lax when the knot is drawn, and, *fourth*, apply the method here described, he will, in my opinion, be doing all that it is possible for man to do in the prevention of one of the saddest accidents incident to the practice of surgery.

The principle that underlies this new method, viz., that of peripheral fixation, is applicable in different ways. For instance, when a pedicle to be secured is slender or composed of soft tissues which are easily compressible and not too bulky, as is often the case, especially in the slighter forms of tubal and ovarian disease, there is no need of central transfixion. If the ligature-ends be simply drawn through the two peripheral points—opposite each other—and a single loop thus made, the ligature cannot slip. The ends of the ligature may then be passed around the entire pedicle as ligated and tied, to prevent the puncture-point bleeding, if thought advisable.

That central fixation is not necessary in the tying of slender pedicles is shown in Figs. 6 and 7. The abandonment of central transfixion in proper cases will save time.

I desire in this connection to acknowledge the artistic services of Dr. James Orton Edie, of this city, in the preparation of the drawings illustrative of the text.

CLINICAL LECTURE.

TUBERCULOUS LYMPHADENITIS—AN OLD DISLOCATION OF THE SHOULDER—SINUS FROM BULLET-WOUND OF THE HUMERUS.[1]

BY ROSWELL PARK, A.M., M.D.,
PROFESSOR OF SURGERY, UNIVERSITY OF BUFFALO.

TUBERCULOUS LYMPHADENITIS.

THIS patient is a girl of fourteen, who has a tumor in the axilla which is not rapidly growing, but which has certainly increased in size in spite of internal medication. You see in her features a pretty fair example of the second type of scrofulous diathesis. There is about them nothing attractive, no pearly sclerotic, no delicate skin, while the features are coarse. The child is a mouth-breather, the tonsils being moderately enlarged, but not enough so to account entirely for the mouth-breathing; neither is there obstruction of the nares. The person who breathes habitually through the mouth without any manifest mechanical interference with nose-breathing will almost invariably be found to be of low intelligence.

The history of the case is very meager; there is no account of an injury to the arm or hand; in fact I can offer no explanation why the axillary nodes should be affected rather than those of other parts of the body. While the nodes are steadily augmenting in size, they

[1] Clinical Lecture delivered at the Buffalo General Hospital.

are not at all fixed in the surrounding tissue, as they would be if the trouble were malignant; nor is there evidence of carcinoma elsewhere in the body to which the nodular enlargement might be secondary. The girl presents the so-called scrofulous diathesis, which simply means that the soil is favorable for the development of tuberculosis. I can trace the involvement of the lymphatics under the pectoral muscles, extending up toward the neck; and it seems to me best, inasmuch as the child has not improved on appropriate medication addressed to the resorption of the enlargements, to remove the larger nodes and thus eliminate the greater part of the diseased process.

The operation is not particularly difficult, though the dissection is a little tedious. I have now removed a large lymph-node from the axilla, somewhat flattened, and the size of a hen's egg. Under the pectoral muscle I find another, disc-shaped, and about three centimeters in diameter. These, with several smaller nodes, I also remove. I shall close the wound without drainage, and apply an antiseptic dressing.

There is a lobular condition of the breasts that might be taken to indicate an extension of the tuberculous process; but I think it is physiologic, because the patient is at about the age of puberty, when the mammary gland enlarges, and is liable to present lobulations. In such a case as this I believe that the hypodermic use of tuberculin would be beneficial. Along with it I should advise the use of guaiacol and tonics.

AN OLD DISLOCATION OF THE SHOULDER.

This patient is a woman, of sixty-two, who fell down stairs sixteen weeks ago, and sustained an injury to the shoulder. She called a young physician who, according to the account given me, did not examine her shoulder very closely, but advised her to apply some liniment or lotion and rest her arm. This was done, but she did not recover the function of the arm, and she summoned a second physician, who discovered that the woman had a dislocation, and a day or two later he anesthetized her, and attempted to reduce it. The arm was bandaged after this attempt; but later it was found that the motion of the joint was not restored. This was eleven weeks ago. It is charitable and not unreasonable to suppose that the first physician reduced the dislocation with his first movement of the arm, so that he did not recognize the condition, and that later the head of the humerus again slipped out of place. It is admitted that he did not see the patient often. I mention the matter, not with any idea of blaming any one, but to impress upon you the necessity of making a careful examination in each case. The patient has been sent to the hospital for relief, but I have said to her and to her physician, that, although I shall make a reasonable effort to reduce the dislocation, I cannot promise that it will be successful; and that if reasonable efforts fail, rather than run any risk of breaking the bone, or rupturing large vessels, I will abandon the attempt and resect the head of the humerus, thus relieving her pain and allowing the arm to be moved. Theoretically it is possible to break the adhesions, but practically it is also possible to break other structures. Once I broke the surgical neck of the humerus in the attempt; but this accident occurred in an insane patient whose bones were more fragile than usual. It has happened in the experience of others that the axillary vein or artery has been ruptured, producing a hemorrhage calling for immediate amputation. So far as the interest of this patient is concerned, it is not justifiable to use much force. The veins and arteries have become more or less brittle from age, while the bones are weaker. The adhesions which have formed in a shoulder-joint sixteen weeks after dislocation are so firm as to render reduction often impossible. In attempting to break adhesions for any purpose in surgical practice, unless you succeed the result is an increase of the evil, because adhesions are composed of organized clot and inflammatory exudate; and when a band is torn, as many must be by active manipulation, hemorrhage occurs, and more exudate is thrown out, glueing the parts still more firmly together. However, in the present instance there is nothing to lose by the venture, for the slight mobility of the arm is of no practical benefit.

With the patient anesthetized and lying on her back, I cannot show you all the signs of dislocation. You will note, however, that the axis of the humerus does not point to the acromion, but internally. Again, beneath the coracoid process I cannot indent the tissues as could ordinarily be done, but I come upon a hard mass which moves when I rotate the arm, and is evidently the head of the humerus.

Dugas' test depends upon the fact that when the head of the humerus is dislocated, and the hand of the injured limb is placed on the opposite shoulder, the elbow cannot be made to touch the thorax. This is on account of the barrel-shape of the thorax. Normally, the upper end of the humerus is away from the thorax, and the lower end can touch it, whereas, in dislocation, the head of the humerus is practically in contact with the thorax, and the elbow cannot also be made to touch the ribs. This test I cannot well demonstrate at this late stage, on account of the adhesions.

I shall show you another test, which is made by driving a sterilized hat-pin into the head of the humerus through the soft parts. You can see the movement of the head of the pin when the humerus is moved.

The attempt at reduction includes, first, rather rude miscellaneous movements to loosen the head of the bone from the nest in which it now lies. I have not only to overcome the displacement of the humerus, but the glenoid cavity has been unoccupied for so many weeks that it has become partially obliterated.

Kelly, of Dublin, has devised a method of reduction that consists in seizing the wrist, wrapping the arm about the surgeon's body and attempting to turn around. This pulls on the arm while, with his disengaged hand, the surgeon tries to direct the head of the humerus into the glenoid fossa. This method is applicable to certain recent cases, but not to old cases. Kocher's method consists almost purely of manipulation, with the exertion of very little force. It consists in extensive outward rotation, followed by traction on the elbow, while the arm is circumducted toward the body with an extensive sweep. As the hand is brought down, the arm is rotated inward.

You have seen me perform these movements, and I now find that the head of the humerus is loose enough, and in that sense the dislocation has been reduced. There is, however, no fossa into which it can fit. I shall

retain the head of the bone in as nearly as possible the normal position for a few days, and then, if there seems to be no prospect of its finding permanent lodgment, I shall advise its resection.

SINUS FROM BULLET-WOUND OF THE HUMERUS.

This patient consults me with regard to a sinus in the right arm and near the shoulder, due to a bullet-wound from a revolver fired at a distance of ten feet. The sinus has persisted for some ten years, during which time pieces of bone have been discharged. Not only does the patient complain of the annoyance of the constant discharge of pus, but of late he has suffered from a numbness in the forearm and "rheumatic pains" in the shoulder. There is no indication that we have a lesion of a definite nerve-trunk. The numbness shifts, and is quite diffuse, showing that no single branch of the brachial plexus is involved. Trouble of this sort is not uncommon in cases of necrosis of bone.

We have to deal with a compound injury of bone, not, however, a compound fracture. In order to trace the direction of the bullet, I have asked the man to show me how he stood when he was shot. He says that the arm was hanging at his side. On inserting a probe I come upon what feels like chalk; that is, carious bone. Just where the bullet is I cannot say. Surgically speaking, there is but one thing to do here; that is, cut down upon and expose the bone, scrape out the diseased area, and, incidentally, remove the bullet if we find it. I shall take no especial pains to find the bullet, for one of the lessons that modern military surgery has taught us is, that a bullet may lie perfectly harmless in the tissues. We have lost the old terror of a piece of lead which has perhaps been rendered aseptic by the heat developed by its rapid passage through the air, and is usually encapsulated in the inflammatory tissue which organizes about it. During our Civil War almost every bullet was sought for. Since then we have learned that it is better to leave the wound filled with clotted blood—the best sealing that it could have—than to churn up the clot with a probe, and further lacerate the tissues in the attempt to locate and extract the bullet. Even to-day nine-tenths of the men who use the probe to find a bullet will use a dirty one. The practical demonstration of the utility of modern surgical principles as applied to military surgery we owe mainly to Europeans. These principles were first put to a severe test in military practice in the Campaign of the Caucasus between Russia and Turkey, and were reported on by Dr. Reyher.

There are times when it is of advantage to know where a bullet has gone, especially when we have to deal with wounds of the skull and brain. It is of advantage to know whether in a bullet-wound of the abdomen the bowel has been perforated or not, but such facts can usually be determined without probing. Again, by studying the direction of the ball when it struck the body, by knowing the bones or sheets of fibrous tissue from which it may have been deflected, by noting what nerves have had their function interfered with, we can derive more information as to the location of the bullet than we can from the use of the probe. For military purposes the probe is generally useless, and often has been worse than useless. Even in this case, when there was nothing to be feared from the use of the probe, it has given me little information that I could not have learned from the history and the appearance of the sinus. The lesson that I wish you to learn from this case is that, if a bullet-wound is properly attended to in the beginning, there is little occasion for secondary interference. Providing the skin be clean, and your hands aseptic, the best treatment you can give a recent bullet-wound is to apply an antiseptic occlusive dressing, and let the wound alone, unless suppuration calls for interference later.

[Later, the bone was exposed, curetted, the sinus eradicated, and an antiseptic dressing applied.]

CLINICAL MEMORANDUM.

OVARIAN SARCOMA WITH ASCITES: OPERATION; RECOVERY.

BY CAPTAIN A. E. BRADLEY,
ASSISTANT SURGEON U. S. ARMY.

MRS. G. W. C., aged sixty-six years, was first seen in October, 1893. Living eighteen miles in the country, her husband informed me that I had better go prepared to tap, giving me a brief description of her condition. I found her sitting in her chair with an enormously distended abdomen; she had been unable to lie down for over two weeks, and was suffering much distress from embarrassment of respiration. I succeeded in obtaining a specimen of her urine, which was found to be normal. There existed a marked degree of gastric distress and uneasiness, with eructations; the tongue was heavily coated, the bowels torpid. Examination of the abdomen demonstrated the presence of ascitic fluid; the lower extremities were extremely swollen. The woman gave a history of a swelling in the right abdomen, first noticed six years previously; it had enlarged slowly, but had never been at all painful or troublesome. In the spring of 1893 her abdomen began to enlarge, and she was examined by a homeopathic physician, who informed her that she had a "floating tumor," and advised non-interference. Later she had received treatment directed to the general condition from a regular physician of high standing, but the abdominal symptoms progressively became worse.

On tapping, three water-buckets full of clear characteristic ascitic fluid were withdrawn; while not accurately measured, there certainly was not less than thirty-six liters. The patient was immediately relieved, and at once was enabled to assume a reclining posture. Examination of the now lax abdomen revealed a firm movable tumor about the size of an infant's head in the right iliac region, somewhat tender to touch. On being assured that a tumor existed, she announced that she never would submit to operative procedures.

Six weeks later a second tapping was necessary, twenty-four liters being removed, and in January a third tapping withdrew a like quantity. The woman's general condition had improved under treatment, and though the tumor was rapidly enlarging, she persistently refused operation.

Early in March I found her suffering from an attack of epidemic influenza, and in such condition that it was thought that she could not survive the day, much less a

fourth tapping, which, other things being favorable, was indicated. I left digitalis and nux vomica, and much to my surprise, a day or so later, learned that she was better, and desired more of the medicine. Her general condition improved to such a marked degree under this treatment that I again urged operation, which she finally accepted, May 14th being the date decided upon. The only available room in the house for operation answered the purpose of best room, general living-room, and bedroom, and was only about 12 x 14 x 7 in its dimensions. It was ordered to be cleaned, and everything was removed except the dining-table, which was utilized as an operation-table. All woodwork was wiped, after thorough cleansing with a sublimate solution, and the patient herself was prepared in the manner usual for abdominal operations.

Assisted only by Hospital-steward Erck, who skilfully administered the chloroform, and Private Hanson, of the Hospital Corps, with a neighbor present who had received a nurse's training in a Chicago school, I operated. A small median incision was made, allowing sixteen liters of ascitic fluid to escape; the tumor proving solid, the incision was enlarged to eleven inches before it could be extruded. There were no adhesions, and the pedicle was not more than three-fourths of an inch in thickness. On casting the silk for its ligation, I found that all the silk prepared for the operation was worthless; it had been boiled for an hour and kept in alcohol until used. Fortunately catgut was on hand, and with this the pedicle was secured and the tumor removed. Digital exploration showed the remaining pelvic organs in normal condition. The peritoneal incision was united by a continuous catgut-suture, the parietes by interrupted catgut, reinforced by a continuous skin-suture; a glass drainage-tube was passed into the pouch of Douglas and secured at the pubic end of the incision, a suture being passed through the edges of the incision here, but not tied. Iodoform, sterilized gauze, absorbent cotton, and gutta-percha tissue comprised the dressing; the tube protruded through the tissue and had a separate dressing, to permit its inspection without disturbing the whole dressing. The duration of operation, from the beginning of the anesthesia, was one hour and fifteen minutes. So skilfully was the chloroform administered that 11 c.c. sufficed.

Evidences of shock were successfully combatted by hypodermics of whiskey and strychnin. The patient was put to bed surrounded by hot bottles, in good condition. She passed a restless night, having persistent nausea, which in a measure yielded to frequent sips of hot water, nothing else being given. On the evening of the operation the temperature was 100.2°, and during convalescence it never rose above 100.8°. Frequent hypodermics of strychnin were given during the night and following day. So great was the discharge of serum that the whole dressing had to be changed on the following morning, and the urine was withdrawn by catheter.

Owing to the distance, the patient was not seen again until Thursday, when the drainage-tube was found to be protruding nearly its whole length from the incision. The nurse said that the woman was passing her urine all right, but the catheter demonstrated a distended bladder, the urine dribbling away—incontinence of retention. The distention of the bladder had forced out the tube; as the discharge seemed to have nearly ceased it was not replaced. The provisional catgut suture to unite the edges about the tube was then taken up, but on inspection it was found that the portion within the tissues had already been absorbed. For several days the catheter was necessary; later a mild cystitis developed, which proved troublesome.

The abdominal incision fortunately united throughout by first intention; the catgut used for the interrupted sutures was defective, and stitch-abscesses developed along the whole incision, discharging for ten days great quantities of pus. Had the interrupted stitch been used through all the tissues, the peritoneum included, the pus would have undoubtedly infected the peritoneal cavity, with fatal results.

It was my intention to use the silk for all tissues, but, as noted, it was worthless at the operation, and the catgut was the only material available. These abscesses and the cystitis retarded recovery, which is at this writing complete. The site of the incision has shrunk to a firm cicatrix, undoubtedly stronger for the suppuration caused by the sutures, and about four inches in length. There has been no return of dropsical conditions, no evidence of a return of the growth, and the patient's general condition is excellent.

The removed tumor was smooth, of a firm fibroid texture, containing no cysts, cutting with resistance, and of a glistening white appearance. It was 5 inches thick, 24 and 21 inches, respectively, in its greater and less circumferences, and weighed 8 pounds; the weight of the fluid removed at the operation was 32 pounds, the total weight 40 pounds.

The following report has been kindly furnished me by Professor Penrose, of the University of Pennsylvania:

"Your report of case and specimen received a few days ago. Microscopic sections show it to be a small spindle-celled sarcoma, *i. e.*, it was composed of a very large number of small spindle-cells and many small round cells. Since there were no adhesions, and the pedicle was so very small, the prognosis it seems should be good, yet because of the associated large amount of ascites, and the fact that sarcoma of the ovary usually returns, no definite prognosis can be given. Fibroma of the ovary is almost always small in size, and the shape of the ovary is not destroyed. Fibroid tumors of large size having the same characteristics as were present in your case originate in the uterus. Sarcoma of the ovary is very rare, occurring in the relation of 1 to 100 (?) ovarian cysts. I hope this report is satisfactory, and hope that we may hear from you again.

"Very sincerely,

"CHARLES B. PENROSE,

"Prof. Gynecology Univ. of Pa.

"Per BEVRA."

When this patient was first seen the symptoms seemed to indicate hepatic trouble. It was learned later that this was the diagnosis given by the regular physician who had seen her. It was impossible to obtain a consultation with other medical men, but after careful study of the case I was positive in the belief that the tumor was the cause of the dropsical condition. It also seemed probable, in view of its slow development, that it was non-malignant, an ovarian fibroma, though the microscpic examination has shown it to be sarcoma. The opera-

tion was performed under difficulties, the unfavorable surroundings, the absence of skilled assistance, and the distance from the post, all rendering it an undertaking the outcome of which could not be assured.

The patient herself, though sixty-six years of age, possessed an amount of courage but seldom seen, and never wavered once in her confidence and belief in the ultimate success of the operation.

Sufficient time has not elapsed to know whether there will be recurrence, but most authorities are inclined to favorable prognosis in such cases.

NOTE.—On November 15, 1894, six months after the operation, the patient was in perfect health, doing her own housework, and maintaining that she had not felt so well for twelve years.

POST HOSPITAL, FORT SULLY, S. D.

NEW DEVICE.

AN IMPROVED FACE-GUARD.

BY JAMES ELY TALLEY, M.D.,
OF PHILADELPHIA.

THE advisability of protecting the face in the examination of a struggling child suffering with diphtheria finds proof in the mortality among physicians from the disease thus contracted. The use of a piece of glass for this purpose is not a new idea; but the first—so far as I know—simple portable device to this end is that recently described by Dr. J. Madison Taylor, MEDICAL NEWS, December 29, 1894, p. 713. This re-suggested an idea that occurred to me while Resident Physician at the Children's Hospital, but which was not followed up because in the other hospitals in which I served I saw little diphtheria.

The device shown in the cut differs from that already exhibited only in that it can be attached to the band of an ordinary head-mirror.

The points of advantage are that it leaves both hands free, does away with the necessity for a second person to hold it, and moves with the head, and is always in the position desired.

In construction, as little metal as possible should be used, so that the instrument shall not be too heavy. The glass is held in place by a screw running the whole width of the guard, so that it can be easily removed, and readily renewed if broken.

If it be desired to hold it in the hand, it may be used as it stands, or the ball-bearing may be tapped for a screw-handle, after the manner of some laryngoscopic mirrors. Sheathed in a flexible case it may be carried in the pocket or in a bag.

FIFTY-FIFTH STREET AND LANCASTER AVENUE.

MEDICAL PROGRESS.

A Case of Rapid Gliosis of the Spinal Cord.—At a recent meeting of the New York Neurological Society, HOLT and HERTER reported the case of a male child, aged one year, with a good family history, in whom, three months before coming under observation, a weakness was noticed in the right arm and hand, and the head began to droop forward. The motor paralysis in the right arm gradually increased, and finally there was complete loss of power in both arms and in the shoulder-muscles, with atrophy. The muscles of the neck were exceedingly rigid, and the head was carried stiffly, slightly in advance of the normal position, with the face looking directly forward. There seemed to be some loss of power in the legs. The knee-jerks were exaggerated, especially on the right side. Ankle-clonus was present on both sides. There was considerable dyspnea, and coarse râles could be heard over the entire chest, but there were no signs of consolidation. The temperature showed irregular daily variations, ranging from 100° to 105°, and even higher. There was occasional vomiting. The pupils were equal, normal in size and responsive to light. There was partial analgesia of the body below the arms. The respirations ranged from 32 to 52 per minute. After the lapse of a month slight strabismus was noticed, and the head was rolled continually from side to side. At times there was marked cyanosis. The temperature rose to 106°, and death took place.

Upon post-mortem examination a grayish, projecting mass was found occupying almost the entire right side of the medulla and a larger part of the left side. The medulla was considerably enlarged from before backward, and from side to side. There was also considerable enlargement of the cord as far down as the eighth cervical segment, and from this point to the sixth dorsal there was some enlargement; below this the cord appeared to be normal. Histologic examination, made at different sections of the cord, revealed a typical gliomatous structure, which involved to a greater or less extent the medulla and almost the entire cord. The appearance of the preparations examined renders it probable that the new formation of glia-cells was derived from the proliferation of the ependymal and peri-ependymal cells. Although the new growth involved almost the entire extent of the cord, it is only to the well-developed growth in the upper half of the cord that the symptoms presented by the patient are to be attributed. The high temperature could hardly be accounted for by the pulmonary condition present, and was probably due to the rapid destruction of nerve- elements in the spinal cord.

Nephrectomy for Sarcoma of the Kidney in a Child Twenty-five Months Old.—At a recent meeting of the Allegheny County Medical Society, at Pittsburg, DR. X. O. WERDER reported the case of a girl, twenty-five months old, that came under observation on account of a small umbilical

hernia which had been present for three months. Examination, however, disclosed also a growth in the left hypochondriac region, somewhat larger than an egg. The tumor grew rapidly in size until it occupied the greater part of the left half of the abdominal cavity, extending from the ribs to the crest of the ilium and downward into the left iliac fossa, to within about an inch of the umbilicus, and filling out the left lumbar region. The tumor was not sensitive to touch, and was slightly movable in an antero-posterior direction. The child was plump and healthy in appearance, although there had been some wasting. A diagnosis of malignant disease of the left kidney was made, and nephrectomy advised. Accordingly, an incision about six inches long was made in the left semilunar line, and subsequently enlarged an additional two inches. The peritoneum over the tumor was incised, the very thin surrounding fatty capsule opened and peeled off, and the tumor lifted from its bed, together with the kidney, which was behind and continuous with the growth. The pedicle was ligated at the hilum of the kidney, and included all of its structures; several bleeding points were ligated; the cavity was carefully sponged out and closed without sutures, and the abdominal wound united with silkworm-gut sutures, without drainage. The child stood the operation well. Little blood had been lost. Urination took place spontaneously about two hours afterward, and during the night about ten ounces were passed. The child was dismissed from observation fifteen days after the operation, and subsequently gained considerable flesh. The growth proved to be a rhabdomyo-sarcoma originating from the kidney.

Unusual Malformations of the Brain.—At a recent meeting of the Association of American Anatomists in New York, PROF. BURT G. WILDER showed three remarkable specimens from the collection of Cornell University:

1. An adult human brain with a complete interruption of the central fissure. The total number of such cases recorded does not exceed twenty.

2. A sheep's brain, lacking the callosum or great cerebral commissure. Several human brains with this defect have been described, but the only other cases in animals are three cats, all in the Cornell Museum.

3. A three-months' human fetus with the left olfactory bulb, commonly rudimentary, half as long as the cerebrum, as in most of the lower animals, and containing a considerable cavity. It has long been a belief of Prof. Wilder that the olfactory apparatus is primary and of great morphologic importance; that the recognition of food by smell was once more essential than reflection upon its qualities. The specimen in question, believed to be unique, suggests the possibility of reversion toward a far-off ancestral type.

To Examine the Larynx and to Remove Laryngeal Growths in Young, Nervous, or Unmanageable Children, SPICER (*British Medical Journal*, Nos. 1769, 1770) recommends the preliminary cautious use of a 10 per cent. solution of cocain, followed by the inhalation of chloroform to maintain moderate general anesthesia. An assistant holds the child in the usual position for laryngoscopy, while another stands behind the patient and keeps the head erect and square to the operator; a third assistant stands behind and to the right, holding the mouth-gag; while a fourth holds the tongue out with forceps. In the removal of neoplasms sittings may be repeated at intervals of one or two weeks.

THERAPEUTIC NOTES.

The Treatment of Diphtheria with the Antitoxin.—At a recent meeting of the Clinical Society of London, WASHBOURNE, GOODALL, and CARD (*British Medical Journal*, No. 1773, p. 1417) reported the results of observations made at the Eastern Hospital in 80 cases of children under fifteen, submitted for treatment with the antitoxin of diphtheria. Bacteriologic examination was made in all, but diphtheria-bacilli were found in but 61. Eight of the cases in which diphtheria-bacilli were not found would have been considered not to have been diphtheric had a bacteriologic examination not been made; these were excluded from the statistics. The other 11 at first presented the appearances of diphtheria, but their further progress fully bore out the bacteriologic evidence. Among the 72 cases there were 14 deaths (19.4 per cent.). The significance of this mortality becomes apparent when compared with that of previous years. During the year 1893 there came under observation 397 cases, with 166 deaths (41.8 per cent.); from January 1, 1894, to October 22, 1894, 400 cases, with 144 deaths (36 per cent.); from January 1, 1893, to October 22, 1894, 797 cases, with 310 deaths (38.8 per cent.); from September 14 to October 22, 1894, there were 72 cases not treated with serum, with 28 deaths (38.8 per cent.); from October 23 to November 27, 1894, 72 cases treated with serum, with 14 deaths (19.4 per cent.). Of the 61 cases shown bacteriologically to be diphtheric, 13 died (21.3 per cent.). Among the whole number tracheotomy was required in 9 cases, with 3 deaths. The serum used was obtained from the British Institute of Preventive Medicine and was administered as follows: In severe cases, 20 c.cm. were injected when the patient was first seen, followed by 10 c.cm. in from eighteen to twenty-four hours, and again another 5 or 10 c.cm. in from another eighteen to twenty-four hours. In moderately severe cases a first dose of 10 c.cm. was injected and followed by one of 5 c.cm. the next day, and perhaps another of 5 c.cm. a day later. In mild or doubtful cases, a single dose of 5 c.cm. was injected if there were reason to suspect that the condition was likely to become worse.

HERRINGHAM (*Ibidem*, p. 1428) related that 22 cases had been treated at St. Bartholomew's Hospital with the antitoxin, and that in 4 diphtheria-bacilli were not found. Of the remaining 18, 7 were mild and all recovered; 5 were severe; 6 very severe. Tracheotomy was required in 10 of these 11, with 3 deaths, and in 1 intubation. In previous years tracheotomy had been performed in 63 cases, with 41 deaths.

KOSSEL (*Deutsche medicinische Wochenschrift*, 1894, No. 51, p. 946) has made a further report upon the use of the antitoxin in the treatment of diphtheria at the Institute for Infectious Diseases in Berlin. From March 15 to December 1, 1894, there came under observation 119 cases, of which 2 were moribund and were not treated with the antitoxin. Among the 117 there were 13 deaths (11.1 per cent.). There came under observa-

tion on the first day 14 cases, all of which recovered; on the second day 30 cases, with 29 recoveries; on the third day 29 cases, all of which recovered; on the fourth day 9 cases, with 8 recoveries; on the fifth day 11 cases, with 9 recoveries; on the sixth day 6 cases, with 3 recoveries; on the seventh day 5 cases, with 3 recoveries; on the eighth day 6 cases, with 3 recoveries; on the ninth day 1 case that died; and on uncertain days 6 cases, with 5 recoveries. Bacteriologic examination was made in all cases; in 2 diphtheria-bacilli could not be found, but in 1 of these a complicating otitis media developed, and was attended with perforation, and in the pus discharged diphtheria-bacilli were present.

The mortality in the children's department of the Charitié, among cases not treated with antitoxin, was, in 1889–90, 52.4 per cent.; in 1890–91, 60.1 per cent.; in 1891–92, 62.8 per cent.; in 1892–93, 56.4 per cent. In 23 of the cases treated with the antitoxin, tracheotomy became necessary, with 11 recoveries (47.8 per cent.). Of the 104 cases in which recovery ensued, 57 were free from albuminuria, which was present in 41. Of the latter the albuminuria persisted but a single day in 9 cases; for two or three days in 11; for from four to seven days in 9; and for longer periods in 12. In 10 of the 13 fatal cases albuminuria was present on admission. Paralyses developed in 19 of the 104 cases that recovered. In 5 cases the action of the heart was disturbed. No relapse was observed. As to dosage, recent cases received 600 immunity-units; cases with doubtful prognosis, 1000 immunity-units; and cases of long duration, 1500 immunity-units.

TREYMANN (*Ibidem*, p. 951) has reported the case of a child, three years old, in which acute hemorrhagic nephritis developed in the sequence of an attack of diphtheria of moderate severity treated with the antitoxin. The child came under observation on the third day of the disease, and at once received an injection of serum No. 2 (1000 immunity-units), and on the following day an injection of one-half the dose of serum No. 3 (750 immunity-units), which was repeated a day later. For a time improvement manifested itself, but in the course of two weeks the membrane in the throat reappeared, and a further injection of serum No. 1 (600 immunity-units) was given. On the following day albumin appeared in the urine for the first time; the renal secretion became scanty in amount and hemorrhagic in character, and microscopic examination disclosed the presence of red and white blood-corpuscles, with tube-casts and epithelial cells. Several days later complete anuria developed for twenty-four hours, with edema of the eyelids, but the condition gradually subsided and progressed to ultimate recovery.

In contrast with the preceding case SCHWALBE (*Ibidem*, p. 952) has reported the case of a child, ten-and-a-half years old, in which acute hemorrhagic nephritis developed in the course of an attack of diphtheria not treated with antitoxin.

REMBOLD (*Ibidem*, p. 963) has reported the case of a girl, seven-and-a-half years old, in which paralysis of accommodation developed in the sequence of an attack of diphtheria treated with the antitoxin. Two injections each of serum No. 1 (600 immunity-units) were made on the second and third days of observation respectively. The visual defect was noted several weeks after recovery from the primary disease. In a second case in a girl, eleven years old, a single injection of serum No. 1, made on the first day of observation, was followed in nine days by the appearance of a scarlatiniform exanthem upon the upper and lower extremities. Two days later the child complained for a few hours of pain in the sacral region and in the lower extremities, and for five days there was inability to stand. The eruption gradually disappeared in the course of four or five days, and recovery was ultimately perfect.

A Pemphigoid Eruption Following the Administration of Copaiba.—SEQUEIRA (*British Medical Journal*, No. 1768, p. 1108) has reported the case of a man, twenty-eight years old, who, for the relief of a slight attack of urethritis, took three capsules of copaiba at night, followed by five on the following day. After the lapse of another day the face became swollen and red, and the body covered with red patches. In the evening several blisters appeared on the legs. When seen, the face was slightly swollen and red, and the arms and thighs presented irregular erythematous patches somewhat raised above the surface. Upon the lower portion of each leg over the tendo Achillis were large bullæ about the size of a small hen's egg, together with several smaller ones, six on the right and five on the left. The walls of the bullæ were strong and tense and contained clear serum. They were not surrounded by areolæ, and after rupture the exposed skin rapidly closed over under treatment.

In the Treatment of Pleural Effusion SÉGALÉA (*La Mèdecine Moderne*, 1894, No. 101, p. 1580) has employed with success topical applications of guaiacol in the following formula:

℞.—Guaiacol . . . . . ♏ xxxvi.
Glycerin } . . āā f℥ss. M.
Tincture of iodin }

The applications are made by means of a brush to the entire posterior aspect of the chest, which is then covered with cotton and an impermeable dressing and a bandage.

In a case of anasarca, with anuria, in the sequence of scarlatina, in which other measures had failed, applications of the following combinations were soon followed by relief:

℞.—Guaiacol . . . . . ♏ xvi.
Glycerin . . . . . f℥ss. M.

In the Treatment of Trachoma, GRAY (*Journal of the Arkansas Medical Society*, vol. v, No. 2, p. 55) recommends the employment of a powder of resorcin (one part) and boric acid (five parts). The eyelid is strongly everted and thickly dusted by means of a camel's-hair brush with the powder, which is well rubbed in with the end of the little finger. In order to reach granulations in the retro-tarsal fold, the flat, blunt end of a nail-cleaner of bone or ivory is used. The pain resulting from the application lasts for from a few minutes to nearly an hour. The frequency of application is governed by the effect, as shown by the degree and duration of the irritation. In some cases an acute granular conjunctivitis may be induced. The treatment is applicable to advanced cases of chronic diffuse trachoma, but not to cases of acute or follicular trachoma.

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THE NATURE, ACTION, AND SPECIFICITY OF ALEXINS AND ANTITOXINS.

THE conditions underlying natural or inborn immunity are quite different from those concerned in acquired immunity. Many different theories have been advanced to explain the nature of the former, but no one of them is altogether satisfactory. According to some authors, headed by BAUMGARTEN and PETRUSCHKY, natural immunity is often due to the absence in the animal of nutriment of a character suitable for assimilation by the specific bacterium that causes the disease. Although this hypothesis may have a basis of fact in a certain number of instances, it will by no means explain all cases of natural immunity.

It is quite possible that in some animals a natural immunity to many microörganisms is directly dependent upon certain physiologic peculiarities. Thus KARLINSKY states that the immunity from anthrax which snails possess is partially due to the acid that they manufacture, and a similar explanation may hold good for the local immunity (*e. g.*, from anthrax) seen in many animals when the virus enters the stomach.

Undoubtedly, in attempting an explanation of this question many factors have to be considered, and on close examination the safeguards with which the higher animals are provided will be found to be manifold and often complex. When we remember that we constantly carry about with us in the cavities, as well as on the surface, of our bodies, microörganisms that under favorable conditions are capable of giving rise to serious and sometimes fatal infectious processes, the importance of a due appreciation of the natural resisting powers of the body becomes easily evident. While the integrity and well-working of the local defensive mechanisms (*e. g.*, epithelial membranes, ciliated surfaces, antiseptic secretions), which in the main are either mechanic or chemic in their action, are of the highest importance in determining susceptibility, we know that even when pathogenic bacteria have eluded these peripheral sentries the body still holds in reserve active agencies for combatting their growth and multiplication, and is often still capable of destroying them completely. According as these mechanisms are efficient or inefficient in protecting against a specific bacterial virus, we can speak of an individual as being insusceptible or susceptible to infection with that bacterium and to the particular disease to which it gives rise.

The efficacy of the machinery of defence varies with the general nutrition, so that an animal may at times prove susceptible to a virus from which the species is ordinarily immune. Further, the differences in susceptibility which various species show to infection with the same variety of bacteria have long been known, and can only be explained by the assumption of corresponding variations in the defensive mechanisms.

The nature of the internal protective processes, with the exception of the filtration by organs such as the lymph-glands and the spleen, has been much disputed. One class of investigators attribute the main credit of the internal natural resistance to an active warfare waged by certain cells of the body, of mesodermal origin, especially the leukocytes and endothelial cells; the members of another school claim that it is in the germicidal power of the fluids of the body that the explanation of natural immunity must be sought, and that the phenomena usually classed as chemotaxis and phagocytosis are secondary and subordinate.

That the blood-serum when removed from the body does possess definite germicidal power has been proved beyond a doubt, notwithstanding the objection of VON CHRISTMAS, who stated that it was

only the old and degenerate bacteria which, when introduced, did not multiply, and that of JETTER, METSCHNIKOFF, and HAFFKINE, who believed that the results that had been adduced in support of the idea of a germicidal activity of the serum were not specific, but were rather to be looked upon simply as due to the injurious effects that are known to follow the sudden transference of bacteria from one medium to another of different concentration.

That extra-vascular blood-serum exercises a germicidal influence does not, of course, prove that the blood within the vessels of the living body possesses the same power. It has even been urged that the appearance of germicidal activity in the serum may follow and depend upon degenerative changes in the blood that only come about after its withdrawal from the body.

It would take too long to enter fully here into the arguments dealing with the question. It may be stated, however, that direct experiments have been made by BUCHNER, STERN, and ENDERLEN to show that the intra-vascular blood possesses definite germicidal power.

Again, it is claimed that the germicidal activity of blood-serum is most marked immediately after its removal from the body, and, further, that the blood of animals naturally immune from anthrax is more actively bactericidal than that of susceptible animals, although there are several experiments, the results of which appear to contradict this latter statement. The facts that the toxins of bacteria can completely destroy the germicidal power of serum (LUBARSCH), and that rattlesnake-poison completely abolishes it (WELCH and EWING), are in favor of the view that the germicidal activity is normally possessed by the intra-vascular blood.

The germ-killing power of the blood-serum has been shown to depend upon the presence in the latter of certain chemic substances very complex in their nature, presumably allied to the albumins, and which have been called by BUCHNER, alexins, and by HANKIN, defensive proteids. It is probable that the alexins have their origin in the cells of the tissues. These substances, whatever they are, are very unstable bodies that soon disintegrate after leaving the animal body. Heating to the temperature of from 50° to 55° C. for half an hour destroys them, as does the prolonged action of light or an excessive supply of oxygen. As we have had occasion to point out before in these columns, when writing of the teleology of sunburn and tan, it would seem as if it were by no accident that the blood and organs are buried within the body as in a dark chamber.

The alexins are even more unstable than the enzymes, such as trypsin and papayotin; but, unlike the unformed ferments, they are incapable of causing hydrolytic cleavages, though they can destroy bacteria against which the ordinary ferments are inactive.

It would appear that the same substances on which its germicidal activity depends are also responsible for the well-known globulicidal power of the blood-serum; that is, the power of destroying the red and white blood-corpuscles of an animal of a different species.

One curious fact that has been made out is that the activity of dogs' serum or of rabbits' serum is diminished by the addition of water, but can be re-established by adding an amount of sodium chlorid sufficient to restore the normal concentration of the fluid. The action of salt appears to be only indirect, its presence rendering possible the action of the serum-alexins, and potassium and ammonium chlorids, as well as potassium, sodium and ammonium sulphates, exercise the same influence as the sodium chlorid. The addition of sulphates of the alkalies to the diluted serum increases the activity of the alexins and heightens the resistance of the latter to the effects of heat so that they can withstand a temperature higher by at least 10° C. BUCHNER maintains that the addition of the salt to the serum increases its resistance to heat by extracting water from the alexins, and, in order to account for the complexity of the bodies, suggests that they may not be simply substances in molecular solution, but that the serum may represent a micellar solution, an explanation which it may be remembered was long ago suggested by NÄGELI for the differences between crystalloids and colloids.[1]

[1] Buchner even suggests the possibility of the existence of chains or bands of micellæ with water-molecules lying between the individual members of the chain. If the entrance of salt into the interior of the micellar bodies or chains was prevented, then, according to the laws of osmosis, the surrounding fluid, as it increases in concentration, must remove water from the micellæ or micellar bands. Again, a diminution of the amount of salt in the surrounding fluid would lead to an increase of the water in the micellæ. The latter change would lead to swelling, the former to increased consistence of the micellar structure, and hence to increased resistance to an external agent such as heat. Buchner lays considerable stress on the distinction between active and inactive albumins, and thinks that the differences may possibly be explained by alterations in the micellar arrangement of molecules that are chemically constant.

As much or more difference of opinion exists concerning the nature of acquired immunity as concerning the natural resistance that an organism offers to infection. While there is evidence that through artificial means the natural resistance can be increased, yet it would seem that in acquired immunity the protection does not depend upon the same factors as are concerned in natural or inborn immunity. In acquired immunity the blood-serum of the animal possesses definite antitoxic power against the toxins of the bacterium against which it has been immunized when injected with them into a susceptible animal.

The substances in the blood-serum of immunized animals upon which the antidotal power is dependent are very different from the alexins of normal blood-serum. The antitoxins are tolerably stable; moreover, so far as is known, unlike the alexins, they are not variable according to the species of animals from which they come, but are dependent upon a reaction to the toxins of the variety of bacteria from which the animal is rendered immune.

If the blood-serum of an animal naturally immune from a certain bacterial infection be introduced into the body of an animal naturally susceptible to the same infection, so far as is known little or no protection is afforded by the procedure. In acquired immunity and in cases in which an animal has been rendered "poison-proof," the antitoxins are transferable to another animal, and a temporary and *passive* immunity is conferred upon the latter. This transferred immunity must not be thought, however, to be paramount to the immunity gained by an animal by the injection of virus or toxins. In the latter case the body of the animal has suffered a reaction to the toxins; the immunity is *active*, and the cells of the body go on producing antitoxic substances even after large quantities of blood have been removed from the animal. In the animal that has only *passive* immunity, on the other hand, it is believed that the cells do not manufacture the immunifying substances, so that the period of immunity will depend mainly upon the amount of antitoxic serum introduced, and the protection will gradually become less sure as the antitoxic compounds are gradually eliminated from the blood through the excretory organs.

We have in a previous article pointed out that the term antitoxin is badly chosen, since its use might create an impression that a direct destruction of the toxins is understood to occur. BUCHNER succeeded in preparing antitoxic substances in a dry condition from the blood-serum of animals rendered insusceptible to tetanus, and mixed them with dry tetanus-poison. On injection of this mixture into white mice the animals were not disturbed, though when introduced into guinea-pigs in the same proportions it gave rise to distinct symptoms of tetanus. BUCHNER believes that this experiment alone is proof that the tetanus-poison and the antitoxin act separately in the organism, the latter rendering the tissues and cell-territories less susceptible to the action of the former. Since the cells of the guinea-pig require more antitoxin to render them insusceptible to the toxin of tetanus than do those of the white mouse, the specific organization of the body of the animal in which the mixture of poison and antidote is being tried must be looked upon as representing an essential factor in the result.

BUCHNER views the antitoxic activity as an immunizing influence that acts rapidly; but, however this may be, it seems certain that the antitoxins of themselves are not capable of multiplying within the body, and that alone they are incapable of bestowing the peculiar imprint upon the cell-metabolism that, in the immunity acquired through the action of bacteria or their toxins, leads to the manufacture of antitoxic substances.

ROUX and VAILLARD proved that with mixtures of toxin and antitoxin, even when the antitoxin predominated, the phenomena of tetanus could be set up if an animal were previously weakened in any way, or if the products of other bacteria were injected at the same time. It would thus appear as though the tissues and cells of a weakened organism were not able to utilize the antitoxins so as to make themselves insusceptible to the poison in the same degree as those of a healthy organism. A very interesting observation in this connection is recorded by CALMETTE, PHISALIX, and BERTRAND, who showed that the serum of animals rendered immune from snake-poison possesses antitoxic power. When the antitoxin was added to snake-poison in sufficient quantity to render the mixture on injection inactive it was found that on heating the same mixture to 70° C. (a temperature that destroys the antitoxin) the poison again became active.

Finally, observations concerning the specificity of the healing substances have to be mentioned. It has always been believed that the antitoxic substances in the serum of an immunized animal were of a specific nature, that is to say, that the serum of

an animal immunized against diphtheria, for example, would be powerless against the toxins of bacteria other than diphtheria-bacilli, or, in other words, that the substances antitoxic to the products of a specific bacterium could be made inside the body of a living animal only through the action of the same bacterium or its products. The confidence in this doctrine of the specificity of the antitoxins contained in the serum of immunized animals is already shaken.

In the first place, bacteriologists are coming more and more to the view that the products of all bacterial metabolism have much in common, that is to say, that bacteria of different kinds may produce similar or identical poisons, although in very different amounts. The investigations of CENTANNI on the cause of the fever in the infectious diseases tend to show that almost all bacterial forms produce a common pyrogenic substance, the so-called *pyrotoxina bacterica*.

ROUX states that while the normal blood-serum of the horse exercises no effect on cobra-poison, the blood-serum of a horse immunized from tetanus when mixed with cobra-poison renders the latter harmless on injection, and this notwithstanding the fact that the physiologic effects of the toxins of the tetanus-bacillus and of cobra-poison are by no means analogous. The serum of an animal rendered immune from snake-poison does not, however, possess any protective influence against the toxins of tetanus. The serum of an animal immune from tetanus is more actively antitoxic to tetanus-poison than to snake-poison, but the difference appears to be a quantitative, not a qualitative one.

Again, the normal blood-serum of a rabbit has no antitoxic influence on snake-poison, but the blood-serum of a rabbit immunized against hydrophobia is also protective against snake-poison, and will often prevent the injurious effects of from four to five times the ordinarily fatal dose. It is claimed, further, that the serum of animals immunized from snake-poison makes rabbits more resistant to the toxic effects of abrin, and that antiabrin increases the resistance of a rabbit to the action of snake-poison.

The whole subject grows more interesting as it increases in complexity. At the present time sweeping statements are not allowable, for, as LUBARSCH has said, "what is written on immunity to-day may, when it appears in print to-morrow, be already old."

EDITORIAL COMMENTS.

Laminectomy for the Relief of Spinal Compression.—It can scarcely be said that the results of surgical intervention for the relief of compression of the spinal cord resulting from fracture, caries, hemorrhage, neoplasm or what not, have been altogether encouraging; but in a condition in which non-interference must in many, if not most, instances prove inevitably fatal the unfortunate victim should at least be given the chance afforded him. In cases of a chronic and non-progressive character good may be hoped for from expectant and conservative treatment, but in cases of acute compression, or in which the lesion and symptoms are progressive, and in cases in which the diagnosis is in doubt, laminectomy would be justified. Recent medical literature has contained reports of numerous cases in which this operation has not been attended with the expected results. It is, therefore, a satisfaction to be able to cite an instance[1] in which the outcome was favorable. The case was under the observation of Mr. Noble Smith, of London, and occurred in a woman, thirty-one years old, whose spine had been injured by lifting a heavy weight four years before coming under observation. The accident was followed by pain and weakness, not only in the back, but also in the lower extremities. A felt jacket was applied, but with little relief. The symptoms gradually progressed until walking was interfered with. A distinct angular projection was present, its most prominent point corresponding with the tenth dorsal vertebra. Efficient mechanical support relieved the pain in the back, and the patient improved both as regards the general health and the weakness in the back. The vertebræ seemed to become consolidated. A feeling of coldness in the lower extremities and great difficulty in walking, however, remained.

A course of rest, with massage and special feeding, was followed by relief for a short period, but subsequently the difficulty of walking became more pronounced. For a year the patient had been obliged to use crutches. For several years there had been pain of a neuralgic character in the region of the sacrum, gradually increasing in acuteness, with periodic attacks of greater severity. The pain was less when the patient was quiet, but was induced by attempts at walking. The patient was able, when standing between two chairs and supporting herself on them, to lift the knee of each leg up about four inches, and backward to about the same extent. The knee-jerk was natural, and there was no ankle-clonus. There was dulness of sensation upon the anterior and posterior aspects of the thighs and in the legs, and hyperesthesia upon the buttocks and over the sacrum. Laminectomy was decided upon, and the neural arches of the eighth and ninth dorsal vertebræ were removed. There was no fat over the dura mater, which was congested, and in the upper part of the opening in the position beneath the removed arch of the eighth vertebra was found a spongy material like granulation-tissue. This appeared to be the source of pressure upon the cord, and was removed. It covered the dura mater as far downward as it was exposed transversely, being rather thicker on the right than on the left side.

[1] British Medical Journal, No. 1770, p. 1232.

The amount removed was about equal to the contents of an ordinary hazelnut. The patient made a rapid recovery from the operation. The wound appeared quite healed from the third day after the operation, except at the lower part, where a drainage-tube had been left for twenty-four hours. The day following the operation the patient remarked upon the great difference in her sensations, having lost the cold feeling from which she had suffered for several years. She gradually recovered strength, and with a supporting apparatus began to walk about three weeks after the operation. Five months after the operation the former coldness in the lower extremities had not returned, the digestion had improved, and headache and spasmodic jerking of the limbs, which had been present, were gone.

Prenatal Endocarditis.—Our views upon the etiology of endocarditis have hitherto been altogether too narrow. We have been satisfied to believe that in most cases the endocardial inflammation was to be ascribed to an attack of rheumatism, obvious or overlooked, and have ignored the multitude of other factors that may act in a causative way. Rheumatism causes endocarditis either by infection or by intoxication. Any other condition capable of acting in the same way may also give rise to endocarditis —or, as a matter of fact, to inflammation of any or several of the serous membranes. The well-known clinical fact that the left side of the heart is almost invariably alone attacked by endocarditis is explained by the great functional activity of this side. Reasoning on the same line, one would look for right-sided involvement when the endocardial inflammation occurred during intrauterine life. Another explanation for this localization is the transmission of the infection through the placental circulation.

ZARIQUIEY (*Maladies de l'Enfance*, November, 1894, p. 620) has reported a case of right-sided endocarditis that could be used in support of this assumption. It occurred in an infant that at birth presented marked cyanosis, especially upon crying, with a certain degree of dilatation of the veins of the trunk and head and hyperemia of the conjunctivæ. Upon auscultation the normal heart-sounds were heard at all of the orifices, as well as a murmur following, but not obscuring, the first sound, and occupying the period of silence. This murmur was soft and prolonged, and audible over the whole cardiac area, but it was heard with greatest intensity at the base upon the left, and was propagated toward the clavicle upon the same side. There was no edema, and the pulse was normal. At the age of nine months the child had an adeno-phlegmon below the left angle of the lower jaw, and at the age of ten months an exfoliative glossitis. In the eleventh month it died of an extensive phlegmonous process of the scalp. Upon postmortem examination the heart was found to be slightly increased in size as the result of hypertrophy of the right auricle. The coronary veins were tortuous and distended with blood. The tricuspid orifice was narrowed, and the foramen ovale was closed in its posterior two-thirds by a thick fibrous membrane, while the anterior third was divided by a fibrous band passing from the anterior margin of the membrane to the anterior margin of the foramen. The walls of the right ventricle were considerably thickened, while its cavity was reduced in size. The tricuspid ring was thickened, hard, and large. Its leaflets were short and rigid, and the orifice was reduced in size. The pulmonary orifice was so contracted as scarcely to permit the entrance of a probe.

It seems reasonable to conclude that the lesions in this case were due to an inflammation of the endocardium of the right side of the heart during fetal life, and that this was in all probability in its turn due to irritants present in the maternal circulation.

The Treatment of Varicose Ulcers.—One of the most troublesome conditions with which the physician has to deal is that of chronic ulceration of the lower extremities. The affection can be usually traced to a depraved constitutional state, usually in conjunction with circulatory atony, local or general. Many modes of treatment have been recommended, but none is efficacious in all cases. To be successful, therefore, one's resources must be extensive. To the plans already in use SUMMERS (*Medical Record*, No. 1255, p. 655) adds another that commends itself for its simplicity. He has reported the case of a woman, fifty-six years old, who had suffered from chronic ulcers of the legs for many years; the veins, from the knees down, were much dilated and the cutaneous circulation was poor. The treatment consisted in cleansing the ulcers with a solution of sodium bicarbonate, followed by the application of a solution of methyl-violet, care being taken to bring this in contact with the entire area of the base and margins. After allowing the fluid to dry, each stained ulcer was covered with a bit of absorbent cotton, and mechanical support was furnished by an elastic bandage. The entire procedure was repeated every morning. In the course of a few days it was evident that healing had begun, and in the course of several weeks perfect recovery had taken place. We are confident that proper mechanical and gravitational support must play an important part in every form of treatment for varicose ulceration of the lower extremities from which good results are to be expected.

Decrease of Population in Ireland.—From information contained in the annual reports of the registrar-general of Ireland, it appears that the population of Ireland reached its maximum in 1845, when it was estimated to be 8,295,061. A slight decline took place in 1846, but the serious decrease commenced in 1847, the year of the potato famine. During the seven years between 1846 and 1853 the population diminished two million. Since 1853 the decrease has continued at a fluctuating rate. In the middle of 1894 the population of Ireland was estimated as 4,590,700. In the decade from 1841 to 1851 the decrease was 19.9 per cent.; in that from 1851 to 1861, 11.5 per cent.; in that from 1861 to 1871, 6.7 per cent; in that from 1871 to 1881, 4.4 per cent., and in that from 1881 to 1891, 9.1 per cent. In 1891 there were on an average 4.3 acres of land to each enumerated inhabitant, including infants and children, whereas in 1871 and 1881 the proportions were 3.7 and 3.9 acres respectively. These changes are attributed to the serious and repeated failure of the potato crop and to the marked deficiency of manufacturing and industrial occupations for the inhabitants. It is maintained that notwithstanding the falling off in population the aggregate wealth has considerably increased.

Laboratory-Teaching of Large Classes.—At the recent meeting of the American Society of Naturalists, in Baltimore, a communication from PROF. BURT G. WILDER was read, stating briefly the experience at Cornell. The system of Practicums (as distinguished from the laboratory-work of the more special or advanced students) was introduced in 1880 for Vertebrate Zoology, and in 1886 for Physiology. The classes range from 40 to 180. Japanese napkins are used in place of towels. The students seem to enjoy the work. In 1892 a rack was devised, something like a long music-rack, clamped along the middle of a wide table, for holding the text and plates of dissections. Professor Wilder urged that all this work be included in the requirements for admission to college, and cited as a practical argument the inconvenience of storing in alcohol or formalin so many somewhat bulky specimens; for instance, about 170 each of sheeps' hearts and brains, and entire cats.

Cardicentesis, with Recovery.—The ability of vital organs to recover from direct traumatism of a profound character is well illustrated by a case reported by SLOAN (*British Medical Journal*, No. 1772, p. 1368) at a recent meeting of the Edinburgh Medico-Chirurgical Society, in which puncture of the heart with the escape of a considerable quantity of blood was unattended with evil results. The case occurred in a woman, nineteen years old, who, in a fourth attack of acute rheumatism, complicated by endocarditis and pericarditis with effusion, appeared to be *in articulo mortis*, when a trocar was suddenly introduced for the purpose of evacuating the fluid. About ten ounces of blood escaped, apparently from the right ventricle. No bad symptoms followed, but, on the contrary, improvement soon set in, and the case progressed to ultimate recovery.

REVIEWS.

A MANUAL OF MODERN SURGERY, GENERAL AND OPERATIVE. By JOHN CHALMERS DA COSTA, M.D., Demonstrator of Surgery, Jefferson Medical College. Philadelphia: W. B. Saunders, 1894.

THE purpose of this book is "to stand between the complete but cumbrous text-book and the incomplete but concentrated compend." Certainly this is a most laudable object, particularly as teachers of surgery, as of other branches in medical schools, are awakening to a realization of the great value of the recitation in the place of many a lecture in the formal course; are beginning to perceive that an exercise for which the student must prepare himself, and in which he must take a conspicuous part, either to his credit or shame, has educational advantages over the system in which the lecturer only is active, and his hearers merely passive receptacles of his words of wisdom. There is a growing demand for text-books from which the student may learn his recitation. The large work, which comes near supplying the needs of the busy physician, is too extended for the student, and the compends, so compressed that all the flavor, excepting that of a dictionary, is squeezed out of them, fall far short of reasonable requirements. Just what things to insert, and how much they should be condensed, are questions upon which no two teachers, of equally large experience, will agree absolutely; and, therefore, no critic can approve entirely of the selection and treatment of topics in any book. In order to secure perfect accord the author and critic must have been cast in the same mold, and have had identical environments—conditions manifestly impossible.

Dr. Da Costa has, however, in most respects, succeeded so well in his attempt that we predict the adoption of this volume as a class-room text-book by many teachers, and the preference for it by their students over other books that they have used. The author is evidently a good student of surgical literature, and is thoroughly imbued with the most advanced ideas. His style is easy, clear, and direct, and his judgment in selection generally excellent. But, though we can say so much in praise, there are various things upon which we entertain opposite views; and we feel obliged to offer our hearty disapproval of some of his positions. He omits entirely the consideration of diseases of the breast on account of "limited space," while devoting thirty pages to the matter of ligation of arteries in their continuity. The former subject is constantly presented to the general practitioner, is of the gravest importance, and is not usually treated in works on gynecology. The latter comes up for practical consideration but rarely, and is so largely anatomic that a good knowledge of topography is alone almost sufficient equipment for its management. We trust that this serious disproportion will be corrected in the subsequent editions which we expect will be called for.

ATLAS UND GRUNDRISS DER TRAUMATISCHEN FRACTUREN UND LUXATIONEN. Von PROF. DR. H. HELFERICH in Greifswald. Mit 166 Abbildungen nach Originalzeichnungen von DR. JOS. TRUMPP. München: J. F. Lehman, 1895.

THIS excellent little book is one of a series of "Hand-Atlanten" on various branches of medical science which admit of pictorial illustration. It is intended to afford to students an introduction to the important study of fractures and luxations, and to serve as a useful guide to practising surgeons. At first sight it might impress one as belonging to "cram" literature, against which there is a not altogether unwarranted prejudice. But it is really a book to be studied and carefully digested. It is very concisely written, and contains sixty-four lithographic plates and four process-pictures. For some of the plates the drawings were made from the living subject; for some, from museum specimens; and for some, lesions artificially produced upon the cadaver. It is these illustrations which constitute the Atlas. Each plate has a page of descriptive text. The process-pictures are reproductions of photographs from life.

The Grundriss (literally translated, ground-plan) consists of five sections. The first deals with the general subject of both classes of injuries. In the second fractures of the skull are discussed. The third is on the fractures and luxations of the bones of the face and chest; while the fourth and fifth are devoted to these lesions as affecting the upper and lower extremities respectively.

All these topics are set forth in succinct terms, but in a most practical manner. The author, whose name in well known in German professional literature, is obviously a surgeon of wide experience and of truly

conservative views. We are quite sure that this product of his pen will be highly appreciated by all those whose familiarity with the language enables them to avail themselves of its teachings. We should be glad to welcome it in an English translation.

HEALTHFUL WOMANHOOD AND CHILDHOOD. By HENRY BIXBY HEMENWAY, A.M., M.D. 8vo., pp. 270, and Index. Evanston, Ill.: V. T. Hemenway & Co.

"IGNORANCE is not purity," says Dr. Hemenway in the introduction to his work, nor is it modesty. The time when the organic functions were shrouded from all but physicians, in a mist of medieval ignorance and superstition, and were popularly regarded with mingled feelings of curiosity and disgust, is well-nigh past. Intelligent men and women to-day are not ashamed to learn the physiology of respiration or digestion, and if the physiology of reproduction is approached with hesitation born of sensibility and diffidence, a sense of the profound importance of the knowledge prevails, and places its propriety beyond question.

In this book the author treats of the physical life of woman from girlhood to the climacteric: of menstruation, pregnancy, parturition, and many related matters, of embryology and the care of the child, and always in a delicate yet straightforward manner, and in untechnical language adapted to the comprehension of the non-professional reader. One may take occasional exception to a statement, or question the wisdom of detailing some of the information conveyed, but on the whole the book is simple, wholesome, and scientific. It merits the attention of physicians, and is to be recommended for the perusal of intelligent parents.

LANDMARKS IN GYNECOLOGY. By BYRON ROBINSON, B.S., M.D., Professor of Gynecology in the Chicago Post-Graduate School, etc. The Physician's Leisure Library. Detroit: George S. Davis, 1894.

PROFESSOR ROBINSON considers as the landmarks of chief importance in gynecology the following: Anatomy, menstruation, labor, abortion, gonorrhea, and tumors. The first four of these are treated in the present volume, the lectures being largely based upon personal work in dissections, from which are derived a number of original views and new classifications. Much that is valuable and instructive is set forth in an interesting manner, although some of the views held by the author are not in accord with the generally accepted teachings of the day. Thus, he believes in the supporting function of the uterine ligaments, and regards the gluteus maximus muscle rather than the levator ani as the muscle of copulation; he heartily indorses Tait's perineorrhaphy in preference to Emmet's operation. Nevertheless, the book is cleverly prepared and makes interesting reading.

ESSENTIALS OF DISEASES OF THE SKIN. By HENRY W. STELWAGON, M.D., PH.D., Clinical Professor of Dermatology in the Jefferson Medical College. Small 8vo., pp. 261, and Index. Revised edition. Philadelphia: W. B. Saunders, 1894.

IN the preface to this edition of his well-known compend the author says that in making "corrections and additions" the object has not been to extend the text and comparison with the earlier edition shows that this has been attained. The changes, including the additions, are purely revisory, and are based upon recent clinical observation and histologic investigation, as, for example, those on the pathology of seborrhea, the clinical characteristics of seborrheic eczema, the erysipeloid condition affecting the hands of butchers, having its origin in a wound and depending on infection from putrid flesh. Among the additions noted is a description of pityriasis rubra pilaris.

The illustrations of the former editions have been increased in number by the insertion of several new half-tone plates, which, as usual, are only partially satisfactory. It is doubtful if even the best can convey to the uneducated eye an adequate impression of the configuration of the lesions they portray. They will, however, be useful to the student helping to fix in his mind their distribution.

DIRECTIONS FOR LABORATORY WORK IN BACTERIOLOGY. By FREDERICK G. NOVY, M.D., Sc.D., Junior Professor of Hygiene and Physiological Chemistry in the University of Michigan. 8vo., pp. 205, and Index. Ann Arbor, Michigan: George Wahr.

THIS book has been prepared for the use of students of medicine in the University of Michigan, and is designed as a guide to progressive laboratory work in bacteriology. The preliminary exercises are devoted to elementary technique—sterilization of apparatus, preparation of media and culture, staining for microscopic examination—and to the study of the morphology and classification, and the structure and vital manifestations of bacteria. These are followed by schemes for the systematic study of species. In each scheme the morphologic, biologic, cultural, and pathogenic characteristics are indicated, along with the source, historic data, and synonyms. The exercises include the examination of bacteria in water, soil, and air, in sputum and tissues, also methods of inoculation, post-mortem examinations, and the testing of antiseptics. The book is interleaved for the purpose of making sketches and additional notes, and as a supplement to the more elaborate treatise will no doubt be helpful to the student.

THE ELASTIC TISSUES OF THE SKIN: ITS DISAPPEARANCE AND REGENERATION IN RELATION TO PATHOLOGICAL PROCESSES. By DRS. PASSARGE and KROESING. Hamburg and Leipzig: Leopold Voss, 1894.

THIS brochure takes up and discusses the subject in a most thorough manner. A few practical points may be alluded to. The authors find that in all inflammatory and hyperplastic formations (new growths) the elastic tissue disappears in proportion to the intensity of the pathologic process present. It is especially damaged by the infiltration which occurs. It disappears in general only when infiltration has existed. The beginning of degeneration is shown through loss of staining power and a thickening of the caliber of the fiber, which ultimately ends in molecular destruction. Regeneration of the fibers, as concerns the lighter grades of the infiltrating processes, does not seem to take place.

TRANSACTIONS OF THE STATE MEDICAL SOCIETY OF WISCONSIN FOR THE YEAR 1894; vol. xxviii.

THE usual assortment of material is to be found in this volume of *Transactions*, which differs little from other publications of a like nature. Probably the most attractive features are the papers treating of the tonsils and their pathologic states, participated in by Drs. Farnham, Neilson, Rogers, von Szoldrski, and Waterman, and those upon conjunctivitis by Drs. Würdemann, Zimmermann, Bach, and Neymann. Dr. B. Robinson, of Chicago, contributes a paper entitled "Observations on Eighty Recently Performed Laparotomies."

NEWS ITEMS.

Munificent Gifts to Columbia University.—Within the last six weeks Columbia University has received gifts for new buildings representing more than a million dollars. In addition to the two buildings at Bloomingdale, for which $500,000 was given some time ago by as yet secret benefactors, provision for a number of buildings for the College of Physicians and Surgeons has been made by members of the Vanderbilt family, in the sum of $350,000. The Vanderbilt clinic on Sixtieth Street will be enlarged by the erection of a building five stories high and 100 x 50 feet. Another building, 50 x 80 feet, will be erected on Fifty-ninth Street, east of the present main building.

Another important gift in connection with the medical school is one of $200,000 from Mr. and Mrs. William D. Sloane for the enlargement of the Sloane Maternity Hospital to nearly double its present size. Mrs. Sloane has also agreed to provide the additional money necessary for the maintenance and endowment of the enlarged institution. The new building will have a front of seventy feet on Fifty-ninth Street.

These new buildings will completely fill the Fifty-ninth and Sixtieth Streets fronts of the block occupied by the medical school, and will provide an equipment for Columbia far in advance of any other American medical school. The architects are already at work on the plans, and construction will be begun without delay. The property and the main building of the College of Physicians and Surgeons were given by the late William H. Vanderbilt; the clinic bearing his name was erected as a memorial by his children, while his daughter, Mrs. Sloane, endowed the maternity hospital.

Examinations for Diphtheria-Bacilli.—It is announced that the Laboratory of Bacteriology of the Philadelphia Polyclinic will make for physicians bacteriologic examinations in cases of suspected diphtheria. Sterilized swabs and blood-serum tubes, together with instructions for making the inoculations at the bedside, can be obtained from Mr. W. S. Leffmann, Clerk of the Faculty at the Polyclinic Hospital, on Lombard Street, above Eighteenth. The results of the examinations will be reported within twenty-four hours from the return of the tubes to the Laboratory.

Request for Addresses.—We have been asked to announce that many members of the Class of 1879 of the Jefferson Medical College of Philadelphia are desirous of having a class reunion on the occasion of the fifteenth anniversary of their graduation. To fulfil this end members are requested to communicate at once with the President of the class, Dr. Philip R. Koons, Mechanicsburg, Cumberland County, Pennsylvania.

Electric Railway Ambulance.—In the city of St. Louis a street-car, with electric motor attachments, and having an average speed of twelve miles an hour, has been fitted up as an ambulance, to be sent to all parts of the city in response to calls.

BOOKS AND PAMPHLETS RECEIVED.

La Syringomélie Maladie Familiale. Par les Drs. Rene Ver-Hoogen and Paul Vandervelde. Extraite des Annales publiées par la Société royale des sciences médicales et naturelles de Bruxelles, t. iii, 1894.

Why Chronic Urethritis is Ordinarily Difficult of Cure, and an Efficacious Method of Curing It. By Bransford Lewis, M.D. Reprinted from the Tri-State Medical Journal, 1894.

Essentials of Diseases of the Ear. Arranged in the Form of Questions and Answers. Prepared Especially for Students of Medicine and Post-Graduate Students. By E. B. Gleason, B.S., M.D. Philadelphia: W. B. Saunders, 1894.

Addresses, Papers and Discussions in the Section on Surgery and Anatomy at the Forty-fifth Annual Meeting of the American Medical Association, held at San Francisco, Cal., June 5–8, 1894 Chicago: Printed at the Office of the Journal of the American Medical Association, 1894.

Acute Otitis Media, with Illustrative Cases. By Wilbur W. Bulette, M.D. Reprinted from the Medical Bulletin, 1894.

Incipient Inflammations of the Ear in Early Life, and their Sequelæ. By S. MacCuen Smith, M.D. Reprinted from the New York Medical Journal, 1894.

Can Physicians Honorably Accept Commissions from Instrument-Makers? By H. Augustus Wilson, A.M., M.D. Reprinted from the Philadelphia Polyclinic, 1894.

Skin-Grafting for Malignancy of the Orbit. By Flavel B. Tiffany, M.D., Kansas City, Mo. Pamphlet, 1894.

Tea and its Effects. By James Wood, M.D. Reprinted from the American Medico-Surgical Bulletin, 1894.

The Senile Heart; its Symptoms, Sequelæ, and Treatment. By George William Balfour, M.D. New York and London: MacMillan & Co., 1894.

The Medical Register of New York, New Jersey, and Connecticut, for the Year commencing June 1, 1894. Published under the Supervision of the New York Medico-Historical Society. John Shrady, M.D., Editor. Vol. XXXII. New York and London: G. P. Putnam's Sons, 1894.

Ueber die Beziehungen des Ekzems zu den Schleimhauten. Von Dr. von Sehlen-Hannover. Sonder-Abdruck. Monatshefte für praktische Dermatologie, Band xix, 1894.

The Effects of Ethyl Alcohol on the Affinity of Hemoglobin for Oxygen. By John Davis Kales, M.D. Pamphlet.

Laboratory Manual of Elementary Chemical Physiology and Urine Analysis. By John H. Long, M.S., Sc.D. Chicago: E. H. Colegrove & Co., 1894.

Appenti Sall 'Azione Fisiologica e Terapeutica Del l'Ittiolo. Dott. Angelo Ceconi. Estratto Dalla Gazzetta Degli Ospedali e Delle Cliniche. Anno, 1894.

Directions for Laboratory Work in Bacteriology. By Frederick G. Novy, Sc.D., M.D. Ann Arbor, Mich.: George Wahr, 1894.

Bread from Stones. A New and Rational System of Land Fertilization and Physical Regeneration. Translated from the German. Philadelphia: A. J. Tafel, 1894.

The Production of Diseases by Sewer Air. By A. Jacobi, M.D. Reprinted from the New York Medical Journal, 1894.

Transactions of the Medical Society of the State of New York, for the Year 1894. Published by the Society, 1894.